PB86-210176

Report to the Congress of the United States on the Post-Closure Liability Trust Fund under Section 301 (a) (2) (ii) of the Comprehensive Environmental Response Compensation and Liability Act of 1980

(U.S.) Environmental Protection Agency
Washington, DC

Jun 85

U.S. Department of Commerce
National Technical Information Service
NTIS

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. Recipient's Accession No. PB86 210176/AS
4. Title and Subtitle: Report to the Congress of the United States on the Post-Closure Liability Trust Fund Under Section 301(a)(2)(ii) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980			5. Report Date: Date of submittal June 14, 1985 6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address: U.S. Environmental Protection Agency Office of Solid Waste 401 M Street, S.W. Washington, D.C. 20460			10. Project/Task/Work Unit No. WA-13 11. Contract(C) or Grant(G) No. (C) 68-01-6861 (G)
12. Sponsoring Organization Name and Address: same as in #9 above			13. Type of Report & Period Covered: Final 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This report was submitted by EPA to Congress under Section 301(a)(2)(ii) of CERCLA. The report assesses the need for and adequacy of the revenue raised by the Post-Closure Liability Trust Fund (PCLTF) in relation to its estimated future requirements. In preparing the report, EPA used a computer simulation model to estimate the range of potential revenues, expenditures and annual balance of the PCLTF. The report contains an Executive Summary and five chapters on the following topics: Introduction; background on RCRA, CERCLA, and the PCLTF; a description of the computer model; approaches to assessing PCLTF adequacy; results of the computer simulations; and revenue analysis. More detailed descriptions of the computer model and the simulation results are contained in three volumes of appendices.

The report itself does not include any legislative recommendations. However, the transmittal memorandum accompanying the report outlines the Administration's recommendations.

17. Document Analysis a. Descriptors

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited	unclassified	90
	20. Security Class (This Page) unclassified	22. Price

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U.S. Environmental Protection Agency

May 1985

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NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

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EXECUTIVE SUMMARY

This report is being submitted by the Environmental Protection Agency (EPA) to the Congress of the United States under Section 301(a)(2)(ii) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). The report assesses the need for and adequacy of the revenue raised by the Post-Closure Liability Trust Fund in relation to its estimated future requirements.

The Post-Closure Liability Trust Fund ("PCLTF" or "Fund"), established by CERCLA, was designed to accept the liabilities of the owners and operators and to assume the costs of long-term monitoring and care at qualified hazardous waste disposal facilities. To qualify for Fund coverage, a facility must receive a final permit under subtitle C of the Resource Conservation and Recovery Act (RCRA) and must operate and close in compliance with RCRA and the conditions of the facility permit. In addition, the facility must be monitored for up to five years after closing and demonstrate that there is no substantial likelihood of a future release of hazardous constituents.

A tax on the disposal of hazardous waste finances the PCLTF. The tax, which went into effect on October 1, 1983, is set at $2.13 per dry weight ton of hazardous waste, applies to waste disposed in facilities with either interim status or final permits under subtitle C of RCRA, and is collected in a given calendar year only when the unobligated balance in the Fund is below $200 million on September 30 of the previous year. The PCLTF can also receive interest revenue from the investment of money in

the Fund, and Congress is authorized to appropriate up to $200 million in the form of repayable advances.

To assess the adequacy of the Fund, the Environmental Protection Agency developed a computer simulation model. This model is a flexible tool which provides probabilistic estimates of PCLTF expenditures, revenues, and balance over time. In other words, for each year analyzed, the model estimates a distribution of possible outcomes which reflects the uncertainty in factors such as the failure of facilities, the financial solvency of owners and operators, and the likelihood that third-party claims will be legally valid. The model allows the user to specify a wide range of critical assumptions regarding current and future events, costs, and policies. It is essentially a neutral analytical tool that can evaluate a wide range of assumptions, including assumptions about regulatory policies, physical site characteristics, and economic conditions.

Four simulations are included in the report. The simulations include a "Base Case" which reflects the Agency's estimate of the most likely set of policies for implementing the Fund (based on the current provisions in CERCLA and assuming that the tax authority does not expire on September 30, 1985), and three other simulations which look either at the effects of alternative assumptions about PCLTF policies or, in one simulation, the future demand for land disposal of hazardous waste. The reader should note that, with the enactment of restrictions on land disposal as part of the Hazardous and Solid Waste Amendments of 1984, the simulation that assumes a rapid decrease in the demand

for land disposal is now a more accurate representation of the possible future revenues and expenditures of the PCLTF than is the Base Case. Although the policies of the PCLTF are identical in the two simulations, and the results of the two do not differ greatly, in practice the effect of the land disposal restrictions on the tax base of the PCLTF will make the Fund significantly more vulnerable to depletion by large claims, especially in the first 10 to 20 years.

The four simulations, covering a 100-year period beginning in October 1983, form the basis of EPA's evaluation of the adequacy of the PCLTF. Based on these simulations, EPA has analysed the relative share of future land disposal costs borne by the PCLTF and has estimated the tax levels which, under the assumptions used, will keep the Fund solvent for at least 100 years.

The following are the major findings of this report:

- Assuming that few large claims are paid in the first several decades, the PCLTF is likely to be adequate to meet its obligations over the next 20 to 50 years. In the Base Case, there is a 10 percent chance that the unobligated Fund balance will be negative after 21 years and a 50 percent chance that it will be negative after 56 years. There is a 10 percent chance that the PCLTF balance will remain positive for at least 98 years.

- The expenditures of the PCLTF over the next 100 years do not appear to be sensitive to decreases in the amount of hazardous waste that will be land disposed in the future.

- Third-party claims, particularly personal injury claims, lead to relatively infrequent but very large expenditures from the Fund. The timing of these claims is particularly important: large or frequent claims in the early years (for example, years 10 to 20) significantly reduce the adequacy of the Fund. In addition, because the simulations did not explicitly include claims for pain and suffering, loss of consortium, and punitive damages, third-party claims are likely to be much larger than simulated. Since the PCLTF covers liabilities under any State or Federal law,

third-party claims are particularly difficult to predict and estimate. If the Fund did not cover third-party claims, large positive Fund balances could result.

- Approximately one-third of closed land disposal facilities qualify for coverage by the PCLTF but the Fund covers only about one percent of the future costs of routine monitoring and care, response actions, and third-party claims at land disposal facilities. The PCLTF's qualification requirements contribute to Fund adequacy by screening out "problem" facilities. Some of these facilities would be dealt with under the enforcement remedies of CERCLA or the Hazardous Substance Response Trust Fund (Superfund). In addition, an estimated 13 percent of the future costs of land disposal may not be covered by any source of funding.

- Relatively simple changes to the Fund's revenue policies would probably create an adequate Fund. If the $200 million ceiling were removed (so that the tax would be collected every year), a tax rate of about $7.75/dry-weight ton would have a 90 percent chance of producing a positive balance in year 100. In addition, if the tax rate were indexed to inflation, the initial tax rate would be only about $3.00/dry-weight ton.

CHAPTER 1: INTRODUCTION

1.1 Purpose of Report

Section 301(a)(2)(ii) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 ("CERCLA" or "the Act"), required that within three years after the enactment of CERCLA the Administrator of EPA submit to Congress "a report on the necessity for and the adequacy of the revenue raised, in relation to estimated future requirements, of the Post-Closure Liability Trust Fund." This report assesses the probability that the Post-Closure Liability Trust Fund (PCLTF) will be adequate to meet its future obligations.

CERCLA established liabilities for releases of hazardous substances and created two Federal trust funds: the Hazardous Substance Response Trust Fund, better known as the "Superfund," and the Post-Closure Liability Trust Fund. The Superfund provides funds for the cleanup of priority sites and spills at which hazardous substances have been released and for the payment of claims for natural resource damages and responses by third parties.

The Post-Closure Liability Trust Fund accepts the liabilities of the owner or operator and the costs of long-term monitoring, care and response at hazardous waste land disposal facilities which receive final permits under RCRA, close, and monitor the site for up to five years after closing and demonstrate that there is no substantial likelihood of a future release of hazardous constituents. The Fund is financed by a tax on the disposal of hazardous waste in qualified hazardous waste disposal facilities. That tax went into effect on October 1, 1983.

At the time Congress created the Fund, no attempt was made to determine the need for such funds or whether the PCLTF would prove adequate to provide them. These issues are characterized by a high degree of uncertainty. Moreover, the uncertainty increases with time. Future revenues and expenditures of the PCLTF depend on technical factors, such as the quantity and types of hazardous waste generated and disposed; the number, design, and location of land disposal facilities for hazardous waste; and the availability and affordability of alternatives to land disposal (e.g., incineration, neutralization, or recycling); on legal and policy factors, such as the standards of liability under statutory and common law; the availability of alternative sources of funding for long-term monitoring, care, and response; and the regulatory framework for hazardous waste disposal; and on economic factors, such as interest rates and the rate of inflation.

1.2 Scope of Report

This report focuses on the need for and adequacy of the revenues of the PCLTF to meet the future demands that could be made on the Fund. As a key aspect of this analysis, EPA used a computer model to estimate the potential expenditures, revenues and balance of the Fund over time. EPA sought to create a flexible tool capable of incorporating divergent assumptions about future events and policies. EPA believes that the PCLTF Simulation Model meets this criterion, and that the model can be of use in assessing the adequacy of the Fund and in evaluating

alternative policies for the PCLTF and for the hazardous waste program in general.

In addition, EPA recognizes that the PCLTF is so closely tied to the broader issues of hazardous waste management that this report must take into consideration the relationships among the Fund, the Resource Conservation and Recovery Act (RCRA) regulatory program, and the Superfund. For example, the RCRA regulatory program, which, among other things, established requirements for the design and operation of disposal facilities, and for post-closure care, corrective action, and financial assurance, will affect the frequency and magnitude of claims against the PCLTF. Facilities that do not qualify for PCLTF coverage and are abandoned by the owner or operator may eventually require a Superfund-type action either by the Federal government or by the States. Therefore, this report also examines the relationship between the PCLTF and other hazardous waste issues and programs.

1.3 Guide to Report

The remainder of this report is organized into four chapters:

- Chapter 2 provides background on the major issues surrounding the disposal of hazardous wastes; outlines the current Federal authorities under CERCLA and RCRA to clean up waste sites and regulate facilities where hazardous wastes are disposed of; and describes the PCLTF, its history, purpose, and relationship to the rest of the Federal hazardous waste management program.

- Chapter 3 introduces and describes the approach used to model the need for and adequacy of the PCLTF. EPA used a computer model to simulate a variety of possible future events and policies that will determine the need for and adequacy of the Fund. This chapter provides an overview of the model and its major assumptions, data sources, and limitations, and discusses the role of the model in the

overall analysis of the PCLTF.

- Chapter 4 examines the implications of different definitions of adequacy.
- Chapter 5 introduces and explains the policy simulations that were performed as part of this analysis, presents the results in exhibits and graphs, and interprets the results.

Three volumes accompany the report. They describe the computer simulation model and present detailed output from the simulations. Readers who desire a complete presentation of the results of the computer simulations or a more thorough description of the design, assumptions, and data bases of the PCLTF Simulation Model should refer to these volumes: Volume I, Model Overview and Results; Volume II, Graphs and Tables of Model Results; and Volume III, Model Description.

CHAPTER 2: BACKGROUND

This chapter provides the reader with background information on the disposal of hazardous waste in the United States (section 2.1) and on the two Federal statutes which form the basis for the national response to the problems of hazardous waste disposal: The Resource Conservation and Recovery Act of 1976 (RCRA); and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) (section 2.2). Section 2.3 describes the Post-Closure Liability Trust Fund ("PCLTF" or "the Fund") in detail. Section 2.4 examines the relationship between the PCLTF and the regulatory program under RCRA, while section 2.5 makes a similar examination of the PCLTF and the Hazardous Substance Response Trust Fund (Superfund).

2.1 Disposal of Hazardous Wastes

Hazardous wastes contain constituents that may present health and environmental risks for long periods of time. Many organic constituents are stable (degrade very slowly); other hazardous constituents (e.g., toxic metals) never degrade. Yet the existing technology for disposing of hazardous wastes on or in the land cannot be guaranteed to isolate these wastes from the environment forever.

The four most common technologies for disposing of hazardous wastes on or in the land are landfills, surface impoundments, land treatment units, and deep well injection. In general, landfills are pits, trenches, or cells that are covered ("capped") at closure. A surface impoundment is similar to a landfill, except that liquid wastes are usually placed in surface impound-

ments so that evaporation will reduce the volume of the waste. In addition, surface impoundments are often used to store or treat wastes, whereas landfills are used only for disposal. Land treatment refers to the application of hazardous wastes directly onto or into the upper layers of the soil. Some types of organic wastes can be effectively degraded and rendered harmless by microorganisms in the soil, and some inorganic wastes can be bound to upper soil layers. Finally, deep well injection is a disposal technology whereby highly aqueous wastes are injected down well holes into subsurface layers or aquifers. Deep well injection facilities used for the disposal of hazardous waste are, by rule, granted a RCRA permit if they have obtained a permit issued under the Underground Injection Control program of the Safe Drinking Water Act and have met certain other requirements, including the maintenance of an operating record.

A national survey[1] conducted by the Environmental Protection Agency (EPA) found that an estimated 55 million metric tons of hazardous waste, or 14.7 billion gallons, were disposed in the United States in 1981. Of that total, 58.5 percent of the waste was disposed through underground injection, 35 percent was placed in surface impoundments, 5.5 percent in landfills, 0.7 percent in land treatment facilities, and 0.1 percent was disposed by other means.

The survey also found that approximately 4,818 facilities were involved in the treatment, storage, or disposal of hazardous wastes in 1981. That figure includes an estimated 1,063 land disposal facilities (including treatment and storage surface

impoundments). Of course, a facility may use more than one land disposal process (for example, a surface impoundment and a landfill) and may have several inactive disposal units.

The alternatives to land disposal of hazardous wastes include incineration; chemical, physical, and biological treatment; and recycling. Several factors limit these alternatives, and no single alternative is appropriate for all hazardous wastes. Incineration, for example, is useful only for the destruction of organic matter. Treatment technologies are also generally limited to specific wastes, and recycling provides an alternative to disposal only for wastes with a relatively high economic value.

Alternatives to land disposal will certainly increase in the future. From the standpoint of industry, technologies which destroy hazardous wastes or render them less hazardous have the distinct advantage of reducing or eliminating both the need for long-term care of disposal sites and the potential liability of those who generate, transport, and dispose of hazardous wastes. Recognizing the need for long-term protection of human health and the environment, Congress, in the 1984 RCRA amendments, created a major program to restrict the land disposal of hazardous waste. Further potential for a decrease in land disposal arises from industrial process changes which reduce the amount of hazardous waste generated, a goal which is also supported in the RCRA amendments.

Inadequate past practices for handling, storing, and disposing of hazardous wastes have resulted in environmental contamination at thousands of sites around the country. Hazardous waste dump

sites have become a major environmental concern, particularly as they affect the ground-water resources of the nation. For example, of the 546 sites included in the Superfund's National Priorties List[2] (NPL) and the proposed NPL update in August 1983, land-filling of hazardous substances was found at 216 sites, or about 40 percent of the total, while surface impoundments were present at 30 percent of the sites. At 410 sites (75 percent), hazardous substances were detected in ground water. Once contaminated, an aquifer remains polluted for a relatively long time, and it may be extremely difficult to restore the quality of the ground water.

The management of this nation's hazardous wastes requires a long-term commitment both from private industry and from government to ensure that past problems are cleaned up and that hazardous wastes are properly disposed of in the future. Proper management, in turn, requires adequate capacity for the disposal and treatment of hazardous wastes, and long-term care of closed hazardous waste disposal facilities.

2.2 Federal Authorities

This section describes the two statutes which form the basis of the federal authority to manage hazardous wastes: the Resource Conservation and Recovery Act of 1976 (RCRA)[3] and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA)[4].

2.2.1 The Resource Conservation and Recovery Act

The PCLTF is closely tied to the RCRA program for managing the treatment, storage, and disposal of hazardous waste. The PCLTF

can, in fact, be viewed as an owner or operator with perpetual responsibility for closed disposal facilities. This section describes the current RCRA program and some of the 1984 amendments so that the reader can better understand the role of the PCLTF in a national program for the long-term management of hazardous waste. Section 2.4 will discuss several major issues in the relationship between the RCRA regulations and the PCLTF.

Subtitle C of RCRA creates a "cradle-to-grave" management system intended to ensure that hazardous waste is safely transported, treated, stored, or disposed. The major aspects of the RCRA regulatory program prior to the 1984 amendments can be categorized as follows: (1) identification and listing of hazardous wastes; (2) manifest system for tracking hazardous waste from the generator to the treatment, storage, or disposal (TSD) facility; (3) design and operating standards for TSD facilities, including financial requirements; (4) permits; and (5) authorization of State programs.

Identification and listing of hazardous wastes is the first step in the RCRA program.[5] A solid waste is defined as hazardous (unless otherwise excluded) if it exhibits the characteristics of ignitability, corrosivity, reactivity, or EP toxicity; if it is acutely toxic; or if it contains hazardous constituents and is capable of posing a substantial present or potential hazard to human health or the environment.

The manifest system[6] is designed to track the transport of waste from the generator to a facility which has a permit to handle the waste. The manifest originates with the generator;

when the waste is delivered to the designated off-site TSD facility, the generator receives a copy of the manifest to verify delivery. Discrepancies between the shipment and the manifest must be reported.

The design and operating standards[7] include design and operating standards for facilities, requirements for facility closure and post-closure care, ground-water protection requirements, and financial requirements for closure, post-closure care, and liability coverage. The land disposal standards (Part 264 only) require units (other than land treatment units) to have liners to prevent migration of wastes to the subsurface soil or to ground water and surface waters during the active life of the unit. Landfills must also have leachate collection and removal systems (such as drains that collect leachate and pumps that remove it) to minimize the leachate remaining after closure. Surface impoundments, for which leachate collection and removal systems are inappropriate (because of the large quantities of liquids that regularly enter the impoundments), are required to remove liquid wastes and/or solidify the wastes at closure to minimize post-closure leaching of wastes. A variance from the liner and leachate collection requirements is available to units whose owners or operators demonstrate that wastes from their units will never migrate to ground water or surface water.

At closure, all wastes and waste residues must be removed from surface impoundments that are permitted as storage or treatment facilities. Other surface impoundments, as well as landfills, that were closed with the wastes left in place, must have a

final cover (cap) at closure. In such cases, the owner or operator must maintain the facility and monitor for ground-water contamination during the post-closure care period. The post-closure care period generally extends to 30 years after the date of closure, though it can vary based on site-specific considerations.

The ground-water protection requirements contained in Subpart F establish a three-stage program to detect, evaluate, and, if necessary, take action to correct ground-water contamination during the active life and post-closure period or during a longer compliance period specified in the permit. The requirement for corrective action applies only to facilities with final permits. These requirements are at the heart of the RCRA program, since one of the main objectives of hazardous waste management is to protect the quality of ground water.

The first stage of the ground-water monitoring and response program is a detection monitoring program, which requires the permittee to install a ground-water monitoring system at the waste boundary (including both upgradient and downgradient wells) to monitor the ground water for parameters that would indicate whether a leachate plume has reached the waste boundary. If a plume is detected, a second stage -- a compliance monitoring program -- is established. The compliance monitoring program is designed to determine whether the facility complies with a ground-water protection standard that is established for that facility.

The results of compliance monitoring are compared against a

ground-water protection standard. The standard requires that hazardous constituents found in the ground water not exceed certain limits that are specified in the permit. If the ground-water protection standard is violated, the third stage -- corrective action -- is activated. Corrective action consists of the removal of the contamination (by pumping or other means) or in-situ treatment of hazardous constituents and must continue until the standard is complied with.

Owners and operators of treatment, storage, and disposal facilities are required to demonstrate the financial ability to properly close the facility. Owners and operators of disposal facilities must also provide financial assurance for the required post-closure care of the facility. The amount of funds that must be assured is determined by plans and cost estimates prepared by the owner or operator and subject to approval by the EPA Regional Office. Owners and operators may use any of several mechanisms to satisfy the requirements for financial assurance of closure and post-closure care. These include trust funds, surety bonds, letters of credit, closure/post-closure insurance, financial test and corporate guarantee, and State-required mechanisms and State guarantees.

The RCRA program also establishes liability coverage requirements for owners and operators of TSD facilities. The requirements apply only during the operating life of the facility; liability insurance during the post-closure period was found to be infeasible for reasons discussed in Section 2.3 below. By July 15, 1982, owners and operators were required to submit

evidence of coverage for sudden accidental occurrences in the amount of at least $1 million per occurrence and $2 million annual aggregate, exclusive of legal defense costs.

Owners or operators of landfills, surface impoundments, and land treatment facilities are also required to demonstrate coverage for nonsudden, or gradual, accidental occurrences in the amount of at least $3 million per occurrence and $6 million annual aggregate, exclusive of legal defense costs. The requirement for coverage of nonsudden liabilities is being phased in over a 3-year period, with the largest being companies required to show coverage first: those companies with annual sales or revenues over $10 million from all lines of business were required to submit evidence of coverage by January 15, 1983; those with sales between $5 million and $10 million were required to submit evidence of coverage by January 15, 1984; and the remainder were required to meet the requirement by January 15, 1985. The requirements for both sudden and nonsudden coverage can be satisfied by liability insurance or a financial test, or by a combination of the two.

Owners and operators of TSD facilities must obtain individual permits that translate the general standards described above into specific requirements for the facility. New facilities must obtain such permits before they begin construction. A facility in existence as of November 14, 1980, that has applied for a RCRA permit and has notified EPA of its existence under Section 3010 of RCRA, may operate without a permit until final administrative action is taken on its application. Such a facility is said to

have "interim status." These facilities are subject to standards (40 CFR Part 265) that are similar to the standards applicable to permitted facilities (40 CFR Part 264), although there are important differences in the facility design and ground-water protection requirements of Part 264 and Part 265.

The final major aspect of the RCRA program is the authorization of States to regulate the management of hazardous wastes.[8] Under RCRA EPA will authorize a state to administer and enforce its own hazardous waste program if the State applies to EPA for authorization and its program meets the following four conditions imposed by the statute: (1) it is equivalent to and no less stringent than the Federal program under RCRA; (2) it is consistent with the Federal or State programs applicable in other States; (3) it provides adequate enforcement of compliance; and (4) it provides for specific public participation in its permitting procedure. Once EPA approves a State program, the State program operates in lieu of the Federal program in that state. EPA, however, continues to exercise oversight over the State program and may enforce the State requirements or withdraw the State program if appropriate.

The Hazardous and Solid Waste Amendments of 1984, enacted on November 8, 1984, add significant new authorities and requirements to the RCRA program. As mentioned above, the amendments include major restrictions on the land disposal of hazardous waste. Under this program, some wastes may be banned from land disposal altogether, whereas others will have to be treated prior to land disposal. The amendments also expand the responsibilities of

the facility owner and operator to undertake corrective action to clean up ground-water that has been contamined by releases at the facility. The amendments require that the owner or operator of a facility seeking a permit assume the responsibility for cleaning up releases from solid waste management units at the facility (regardless of when the waste was placed in the unit) and demonstrate financial responsibility for completing the corrective action. In addition, the owner or operator is held responsible for corrective action beyond the property boundary as necessary to protect human health and the environment (unless the owner or operator is unable to obtain the necessary permission for off-site actions).

In summary, the RCRA program identifies wastes as hazardous; establishes a manifest system to track the wastes from the generator to the off-site TSD facility; imposes facility design and operating requirements and financial requirements for closure, post-closure care, and liability coverage; enforces the requirements through a permit and through inspections and required submissions; and authorizes States to develop, administer, and enforce their own programs to regulate the management of hazardous wastes. The 1984 amendments strengthen this program in a number of ways, including restrictions on land disposal and expansion of the corrective action responsibilities of owners and operators.

2.2.2 The Comprehensive Environmental Response, Compensation and Liability Act

CERCLA creates two trust funds. The Hazardous Substance

Response Trust Fund, better known as the "Superfund," addresses problems created by past releases and disposal of hazardous substances (a broader term than hazardous waste), including damage to natural resources. The Post-Closure Liability Trust Fund (PCLTF) is directed toward the long-term liabilities and care of Subtitle C hazardous waste disposal facilities. The PCLTF is described in section 2.3 below.

Revenues for the Superfund come from taxes on petroleum and chemical feedstocks and from Federal appropriations. Expenditures from the Superfund pay for removal or remedial actions at priority waste sites and spills. The Superfund does not provide compensation for personal injury.

CERCLA also imposes liability for all costs of removal and remedial actions and any other necessary costs of response consistent with the national contingency plan, and for damages for injury to, destruction of, or loss of natural resources. This standard of liability applies to the release or threat of release of hazardous substances, except for federally permitted releases and several other types of releases listed under section 101(22) of CERCLA.

According to EPA regulations, to be eligible for a Federal remedial action under Superfund, a site must be on the National Priorities List (NPL). Of the nearly 19,000 uncontrolled waste sites presently identified by EPA, a total of 786 sites are on the current NPL[9] and the proposed update.[10] Sites qualify for the NPL either on the basis of their scores on the Hazard Ranking System (HRS) or by being designated a top priority site by a

State or territory.

2.3 The Post-Closure Liability Trust Fund

This section is divided into six parts describing the following aspects of the PCLTF: purpose, eligibility, liability coverage, revenue, claims procedure, and state role. Table 2-1 summarizes the sections of CERCLA that are most relevant to the PCLTF.

2.3.1 Purpose

The legislative history of CERCLA indicates that Congress created the Post-Closure Liability Trust Fund for a number of interrelated purposes:

- To "reinforce public confidence" in the siting of new facilities by ensuring "that funds will be readily available to clean up and restore problem facilities and to pay future claims for property damage and personal injury";[11]
- To "encourage private companies to attract the investment capital necessary to build the next generation of modern hazardous waste management facilities";[12] and
- To assure that disposal facilities do not "pose environmental or public health hazards after closure, and that any potential hazards can be promptly detected and remedied before they cause major damage."[13]

2.3.2 Eligibility

Section 107(k) sets forth the eligibility requirements for the Post-Closure Liability Trust Fund. The PCLTF will pay for post-closure monitoring and maintenance and assume liability for damages and cleanup expenses only when a facility has met the following three requirements:

(1) The facility must have been issued a permit under subtitle C of RCRA. Facilities which close prior to the issuance of a final permit (i.e., while they are still in interim status) will not be covered;

Table 2-1
Guide to Sections of CERCLA Relating to the PCLTF

CERCLA Section	Description
105	Requires revision of the national contingency plan to reflect the responsibilities and powers created by CERCLA. The national contingency plan governs response actions taken under CERCLA, the costs of which may be assumed by the PCLTF pursuant to section 107(k).
107(a-j)	Establishes and assigns liabilities for removal or remedial action, for other necessary costs of response incurred, consistent with the national contingency plan, and for natural resource damages. These are among the liabilities which may be transferred from the owner and operator to the PCLTF.
(k)	Establishes conditions under which the liabilities of the owner and operator of a hazardous waste disposal facility are transferred to the PCLTF, and mandates a study of the feasibility of private insurance as an alternative to the PCLTF. That study, performed by the Department of the Treasury, concluded that private insurance currently is not a feasible alternative to the PCLTF.
111(a)	Authorizes use of money in the Fund for payment of governmental response costs, payment of any claim for necessary response costs incurred by any other person as a result of carrying out the national contingency plan, payment of any claim authorized by section 111(b) and decided pursuant to section 112, and payment of costs specified under section 111(c). This subsection applies to the PCLTF pursuant to section 111(j).
(b)	Authorizes payment of claims asserted and compensable but unsatisfied under section 111 of the Clean Water Act. The subsection applies to the PCLTF pursuant to section 111(a).
(c)	Defines as proper uses of the Fund a variety of costs. This subsection applies to the PCLTF pursuant to section 111(a).
(j)	Authorizes use of money in the PCLTF for any of the purposes specified in section 111(a) or for payment of any other claim or appropriate request for compensation resulting from a release of a hazardous substance from a facility for which liability has transferred to the Fund.

Table 2-1
(Continued)

CERCLA Section	Description
112	Establishes claims procedure for all claims which may be asserted against the Fund under section 111. This section may apply to the PCLTF pursuant to section 111(j), although it is questionable whether Congress intended that this claims procedure be used by the PCLTF.
(c)	Subrogates the Superfund to all rights, claims, and causes of action for any natural resource damages or removal costs paid to a claimant from the Fund. It is uncertain whether this would apply to the PCLTF as well.
(d)	Authorizes the Attorney General to seek to recover, from any liable person, any compensation paid by the Fund to any claimant. Again, this may not apply to the PCLTF; clearly, the owner or operator of the facility is no longer liable.
114(b)	Precludes any person who receives compensation for removal costs or damages or claims pursuant to CERCLA from recovering compensation for the same costs or claims under any other Federal or State law. Similarly, any person who receives compensation under any other Federal or State law is precluded from receiving compensation from the PCLTF for the same costs or claims.
114(c)	Prohibits any requirement that a person contribute to any fund, the purpose of which is to pay compensation for claims for any costs of response or damages or claims which may be compensated under Title I of CERCLA. Therefore, no State may require an owner or operator to contribute to any fund which pays any compensation for claims or costs covered by the PCLTF. A State may, however, use general revenues for such a fund.
222	Prohibits payment of claims out of any source other than the Fund and requires payment of claims in the order of their final determination. This section applies to the PCLTF pursuant to section 232(c).
223	Establishes administrative provisions for the management of the Fund and authority for the appropriation of repayable advances. The authority to borrow expires on September 30, 1985. This section applies to the PCLTF pursuant to section 232(c).

Table 2-1
(Continued)

CERCLA Section	Description
231	Establishes tax on hazardous wastes for the purpose of financing the PCLTF, and establishes definitions and special rules for collecting the tax.
232(a)	Establishes the PCLTF in the Treasury of the United States.
(b)	Limits expenditures from the PCLTF to purposes decribed in sections 107(k) and 111(j).
(c)	Applies administrative provisions of sections 222 and 223 to the PCLTF, and limits repayable advances to the PCLTF to $200 million.
301(a)	Requires a report to Congress "on the necessity for and the adequacy of" the PCLTF, in addition to several other studies with implications for the PCLTF.
303	Places "sunset" on CERCLA authority to collect taxes. Authority expires on September 30, 1985, or when $1.38 billion in taxes for the Hazardous Substance Response Trust Fund has been collected, whichever comes first. The sunset may apply to all authority to collect taxes under CERCLA, including the PCLTF tax.

(2) The facility must have complied with each condition of its permit and applicable subtitle C regulations relating to closure or affecting the performance of the facility after closure; and

(3) The facility and surrounding area must have been monitored for up to five years after closure and must demonstrate that there is no substantial likelihood that hazardous substances or hazardous waste constituents will be released into the environment or that other risk to public health or welfare will occur.

The PCLTF assumes all of the liabilities of the owner and operator starting 90 days after the owner or operator has notified the Environmental Protection Agency that the conditions described above have been satisfied. If the Administrator of the EPA finds that the conditions for transferring the owner and operator's liability to the fund have not been met or that insufficient information has been provided, the owner and operator will continue to be liable until and unless the Administrator determines that the conditions for qualification have been met.

The legislative history of CERCLA states that eligibility for coverage by the Fund was limited for two reasons. First, it was believed that the eligibility requirements would provide "a significant monetary incentive to site owners to design, construct and operate their facilities in an environmentally sound manner, and to fully comply with all subtitle C requirements."[14] Second, it was argued that, "Limiting coverage to low-risk sites should substantially reduce the likelihood that the fund will be significantly depleted by a single incident."[15]

2.3.3 Liability Coverage

The Fund covers three broad areas of Superfund liability:

(1) All costs of removal or remedial action incurred by the

United States government or a State consistent with the revised National Contingency Plan called for by the Act;

(2) Any other necessary costs of response incurred by any other person consistent with the National Contingency Plan; and

(3) Damages for injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction, or loss.

The PCLTF also assumes all liability arising under other statutory law or under common law. Thus, the coverage is broader than that of the Superfund and includes third-party liabilities (e.g., personal injury and economic loss) incurred by the closed facility.

In addition to the Fund's assumption of the liabilities of owners and operators, the Fund may be used to pay monitoring and maintenance costs incurred at the facility by persons other than the owner or operator after the period of post-closure monitoring and maintenance required by RCRA regulations (generally 30 years in duration). EPA believes that the PCLTF cannot be used to pay the costs of post-closure monitoring and maintenance before the end of the facility's post-closure period; all owners and operators of disposal facilities currently are required to perform and to provide financial assurance for the required post-closure monitoring and care of the facility. EPA believes that monitoring and maintenance should remain the responsibility of the owner and operator until the end of the facility's post-closure period.

More importantly, EPA believes that the Fund cannot pay the costs of a corrective action during the post-closure period. Although the legislative history clearly indicates that

liabilities, including "cleanup costs" and "site restoration," are covered by the PCLTF, the requirements for corrective action[16] were promulgated as part of the July 26, 1982 land disposal regulations and therefore were not mentioned by Congress when it established the PCLTF. Moreover, the term "corrective action" has a specific meaning within the context of the RCRA regulatory program and differs from the term "response action" used in CERCLA. EPA believes that the PCLTF covers response costs only after the facility's post-closure period (when the corrective action requirement no longer applies), and thus for purposes of assessing the adequacy of the PCLTF EPA has made this assumption. However, EPA also has examined a case in which costs of corrective action are covered by the Fund from the time the facility qualifies for PCLTF coverage.

2.3.4 Revenue

Revenue for the Fund will come from several sources: a tax; interest on investment; borrowing; and possibly from recovery actions against liable parties. These sources of funds are summarized in Table 2-2.

Section 231 of CERCLA creates a tax for the PCLTF of $2.13 per dry-weight ton of hazardous waste that remains at a qualified hazardous waste disposal facility after the facility is closed. The tax is not imposed during a year when the unobligated balance of the PCLTF in the preceeding year exceeds $200 million. If the unobligated balance of the Fund subsequently drops below $200 million dollars at the end of any fiscal year (September 30),

Table 2-2
Sources of Revenue for the PCLTF

Source	CERCLA Section(s)	Description
1. Tax	§§ 231, 303	° Tax on disposal of hazardous waste -- Rate is fixed at $2.13/dry weight ton -- Tax applies only to waste which will remain after the facility is closed -- Tax is not collected when Fund balance exceeds $200 million ° Authority to collect tax may expire on September 30, 1985
2. Interest	§§ 232(c), 223(b)	° Income from investment of money in PCLTF is credited to the Fund -- Secretary of the Treasury is trustee of the PCLTF and responsible for investing funds -- Investment must be in public debt securities -- Maturity of securities must be compatible with purposes of the the Fund
3. Borrowing	§§ 232(c), 223(c)	° PCLTF may receive appropriations as repayable advances -- Total of outstanding advances not to exceed $200 million at any time -- Advances must be repaid with interest to the general fund of the Treasury ° Borrowing authority expires on September 30, 1985, and all advances must be repaid on or before that date
4. Recovery Actions	§ 112(c)	° PCLTF is subrogated to all claims it pays for natural resource damages and removal costs ° Attorney General may take action to recover from liable parties any compensation for such claims paid by the PCLTF

the tax is reimposed at the beginning of the following calendar year.

The PCLTF tax went into effect on October 1, 1983, and is being implemented by the Internal Revenue Service as a quarterly excise tax. The authority to collect the tax, unless reauthorized, may expire on or before September 30, 1985. A "sunset" on the tax authority is contained in section 303, which states that the authority to collect taxes under CERCLA shall terminate on September 30, 1985, or when the sum of the amounts received under the Superfund taxes reaches $1.38 billion.

The term "dry-weight ton" was not defined in the statute. In the only attempt on record to define the term prior to the passage of CERCLA, Representative James Florio stated: "The term 'dry' in dry weight ton should be interpreted as removing the weight of any water in any hazardous waste in calculating its weight."[17] However, the Internal Revenue Service has neither proposed nor promulgated regulations interpreting "dry-weight ton." Dry-weight measures are not commonly used in hazardous waste disposal; facilities may have to perform additional analysis of waste prior to disposal or else pay the tax on the entire quantity of waste disposed.

A second source of revenue for the PCLTF is interest earned on the investment of money in the Fund. The Secretary of the Treasury, who is designated by CERCLA as the trustee of the PCLTF, is required to invest any portion of the Fund that is not required to meet current withdrawals. Income from all such investments is credited to the PCLTF. The investments must be

in public debt securities (Treasury bills and notes). In addition, maturities must be suitable for the needs of the Fund. In other words, the Secretary should not invest substantial portions of the Fund in securities with long maturities if large, near-term expenditures from the Fund are foreseen.

The PCLTF is also authorized to receive appropriations, as repayable advances, in order to carry out the purposes for which it was established. The total amount of repayable advances outstanding at any time cannot exceed $200 million, and the advances must be repaid, with interest, to the general fund of the Treasury. The authority for appropriations to the PCLTF expires on September 30, 1985, pursuant to section 223(c)(2)(D), and any advances to the Fund must be repaid on or before that date.

The PCLTF may also supplement its revenues, or conserve its resources, through actions to recover from a liable person or persons any compensation paid by the Fund for natural resource damages or removal costs. Under section 112(c) of CERCLA, when the PCLTF pays compensation pursuant to the Act to any person for damages or costs resulting from a release of a hazardous substance, it will acquire by subrogation all rights, claims, and causes of action of the claimant for such damages and costs. The Attorney General, on behalf of the Fund, can then commence an action to recover the compensation paid by the PCLTF. Such an action may be commenced against any person "who is liable, pursuant to any law, to the compensated claimant or to the Fund, for the damages or costs for which compensation was paid." This apparently was drafted with only the Superfund in mind, inasmuch as it applies

only to response costs and natural resource damages and does not reflect the full range of claims for which the PCLTF might ultimately have to pay compensation.

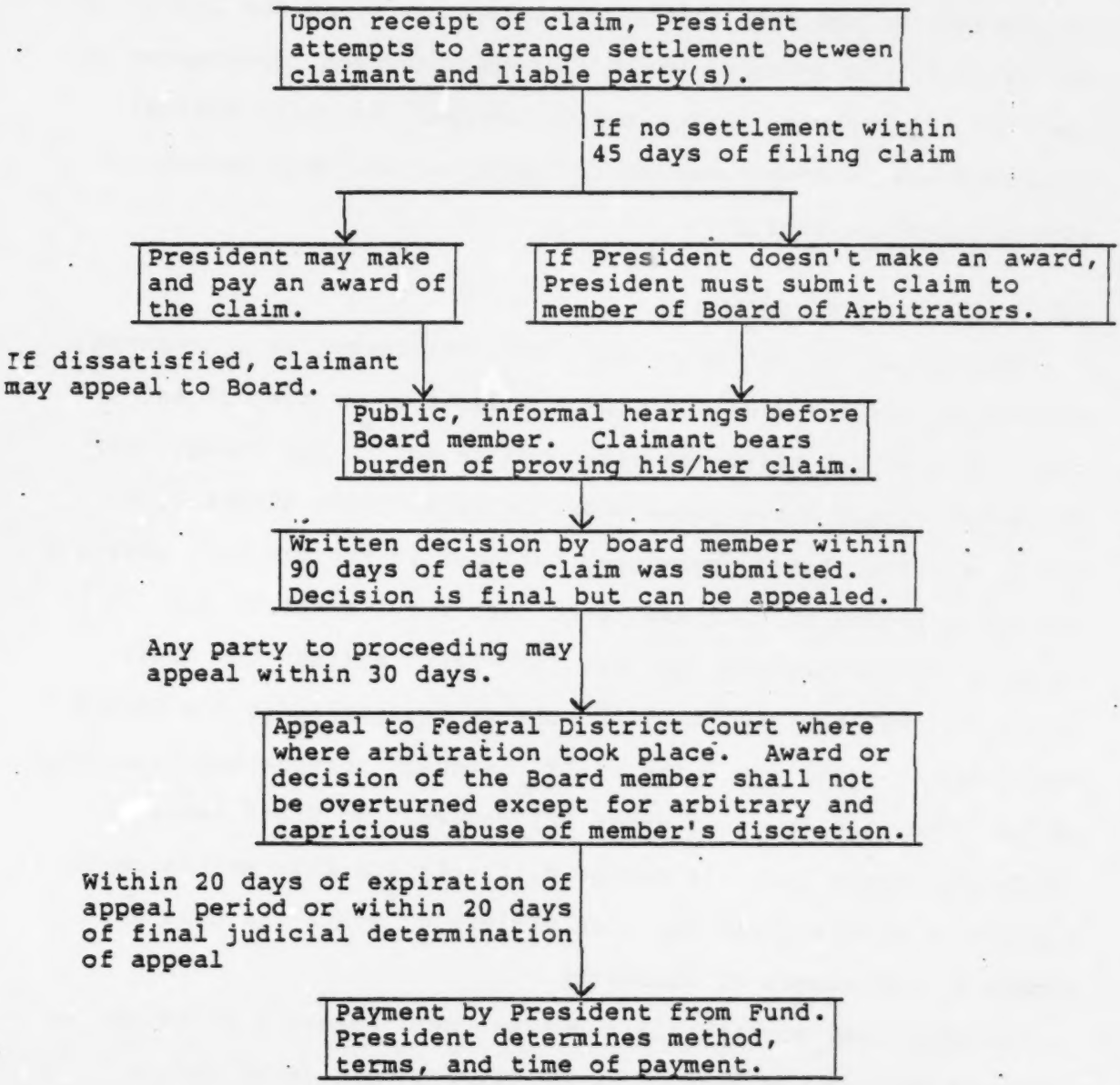
In the case of the PCLTF, a recovery action against the owner or operator of the facility is not possible, since the liability of the owner and operator would already have been transferred to the Fund. A recovery action could, however, be taken against hazardous waste generators and transporters who were associated with or used the facility.

2.3.5 Claims Procedure

Section 112 of CERCLA establishes administrative procedures and mechanisms for handling claims brought under the Act and requires that all claims be presented or action for damages be commenced within three years from the date of the discovery of the loss. The claims procedure, outlined in Exhibit 2-1, probably was not intended by Congress to be used for the PCLTF, and, in fact, is of questionable utility for claims against the PCLTF because it was designed only for claims brought under the CERCLA standards of liability. The PCLTF, however, accepts the liability of the owner and operator under all Federal and State law, including common law. It may be difficult for this mechanism to adjudicate claims under the wide variety of state statutes and common law standards of liability.

In addition, section 112 requires that, before a claim may be asserted against the Fund, it must first be presented to the owner, operator, or guarantor of the facility or to any other person known to the claimant to be liable under section 107. In

Exhibit 2-1
CERCLA Section 112 Claims Procedure
(from presentation of claim to payment from Fund)


Upon receipt of claim, President attempts to arrange settlement between claimant and liable party(s).
If no settlement within 45 days of filing claim
President may make and pay an award of the claim.
If President doesn't make an award, President must submit claim to member of Board of Arbitrators.
If dissatisfied, claimant may appeal to Board.
Public, informal hearings before Board member. Claimant bears burden of proving his/her claim.
Written decision by board member within 90 days of date claim was submitted. Decision is final but can be appealed.
Any party to proceeding may appeal within 30 days.
Appeal to Federal District Court where where arbitration took place. Award or decision of the Board member shall not be overturned except for arbitrary and capricious abuse of member's discretion.
Within 20 days of expiration of appeal period or within 20 days of final judicial determination of appeal
Payment by President from Fund. President determines method, terms, and time of payment.

the case of the PCLTF, the owner and operator are no longer liable; a potential claimant may have to present the claim to generators or other liable parties.

2.3.6 State Role

The role of the States in the PCLTF is relatively limited. In States with authorized programs under RCRA, a facility cannot qualify for coverage by the PCLTF if either the State or the EPA Administrator determines that the facility has not met the conditions for qualification. In addition, any State may impose additional post-closure requirements. States may also use general revenues to establish funds which overlap the coverage of the PCLTF; however, no person can be required to contribute to such a fund directly. Finally, any person who receives compensation from a State fund or from any other source is precluded from receiving compensation for the same claim from the PCLTF. Similarly, any person who receives compensation from the PCLTF is barred by CERCLA from receiving compensation for the same claim from any other source, including State funds.

2.4 RCRA and the PCLTF

The purpose of this section is to discuss two important aspects of the relationship between the Post-Closure Liability Trust Fund and the regulatory program under the Resource Conservation and Recovery Act. The first concerns the effect of the RCRA program on the ability of facilities to meet the eligibility requirements for PCLTF coverage, as established in section 107(k) of CERCLA; the second concerns the effect of the

RCRA program on the potential tax revenues for the PCLTF.

2.4.1 RCRA and PCLTF Eligibility

Eligibility for coverage by the PCLTF follows directly from the RCRA permitting and regulatory programs. First, as mentioned in section 2.3.2 above, a disposal facility must receive a final permit under subtitle C of RCRA; a facility which closes in interim status cannot qualify for coverage by the Fund. Therefore, both the standards for permitting and the speed with which the States and the Federal government issue permits could have a significant effect on the eligibility of facilities for the PCLTF.

Another important issue with respect to facility closure is the eligibility of surface impoundments that operate as treatment and storage units but close as disposal facilities. Under the land disposal regulations, a surface impoundment unit which has been operated as a treatment or storage facility can be closed as a disposal facility (and must be closed as a disposal facility if contaminated soil is not removed at closure). The eligibility of these facilities for coverage by the PCLTF is in doubt, particularly if no tax was paid on the waste disposed at the site.

A facility must also operate in compliance with the requirements of subtitle C and the RCRA regulations "which may affect the performance of such facility after closure" and must close in accordance with the conditions of the facility's permit. Inspection and enforcement programs clearly play a major role in detecting violations of these standards, and records of a facility's compliance history would be essential for determining

eligibility for the PCLTF. However, CERCLA does not provide for the revocation of PCLTF coverage if even a willful violation of RCRA requirements is discovered after a facility has qualified.

Finally, no facility may be accepted by the Fund unless:

> ". . . such facility and the surrounding area have been monitored as required by such regulations and permit conditions for a period not to exceed five years after closure to demonstrate that there is no substantial likelihood that any migration offsite or release from confinement of any hazardous substance or other risk to public health or welfare will occur."

This standard, intended to provide an incentive for the safe design and operation of disposal facilities and to reduce future demands on the Fund, may prove difficult to implement if taken literally. Ground-water monitoring cannot be used to <u>predict</u> the likelihood of a future release from the facility. Ground-water monitoring can detect the presence of hazardous constituents in an aquifer, signaling that a release has occurred. It cannot, however, as a technical matter, provide the information needed to meet a standard of "no substantial likelihood that any ... release from confinement ... will occur." (CERCLA §107(k)(1)(B)).

2.4.2 RCRA and Tax Revenue

The Post-Closure Liability Trust Fund was created by Congress to provide a source of funds for long-term costs of maintenance, monitoring, cleanup and compensation at closed disposal facilities. In order to carry out these perpetual responsibilities, the PCLTF needs a perpetual source of adequate revenue. The RCRA program may have its most significant impact on the PCLTF by affecting the Fund's tax base.

The current tax base for the PCLTF is fairly narrowly defined. It applies only to the disposal of hazardous waste in subtitle C disposal facilities (including interim status facilities). To the extent that the RCRA program decreases the amount of hazardous waste generated or decreases the percentage of hazardous waste going to land disposal, the long-term adequacy of the Fund will be jeopardized.

RCRA could erode the PCLTF tax base in at least two ways. First, the RCRA design and performance standards for land disposal facilities could increase the price of land disposal relative to alternatives, resulting in a reduction in the generation of hazardous waste and/or a reduction in the land disposal of hazardous waste. Second, restrictions on the land disposal of particular wastes, required by Congress in the RCRA amendments, would directly reduce the amount of taxable waste. Of course, other factors, including the long-term liabilities associated with the generation and disposal of hazardous waste, could erode the PCLTF tax base by discouraging the generation and land disposal of hazardous waste.

In any case, the PCLTF relies on land disposal as a long-term source of revenue, which does not appear to be consistent with the current direction and effects of the RCRA program.

2.5 The PCLTF and the Superfund

The eligibility requirements of the PCLTF may have important implications for the Superfund, because facilities which fail to qualify for the PCLTF will remain the responsibility of the owner and operator of the facility and may eventually become sites

that need to be dealt with under the authorities of CERCLA. The extent of the tradeoff between the PCLTF and the Superfund, therefore, depends not only on the eligibility standards for the PCLTF, but also on the financial strength and strategic behavior of facility owners and operators.

If the PCLTF were successful in screening out high-risk facilities, it would decrease its own expenditures but would leave the owners and operators of the high-risk facilities bearing the costs of any cleanup or compensation. If the owner and/or operator subsequently abandons the facility, either through normal business failure or in an attempt to avoid liabilities, the site might become a candidate for Superfund action. It is important to recognize that the PCLTF and the Superfund are not exact substitutes. The most important differences between the two Funds are: (1) The Superfund does not pay claims for personal injury, economic loss, or property damage (except damage to natural resources); and (2) the Superfund cannot be used to pay for long-term monitoring, maintenance, and care at hazardous waste disposal facilities which have not yet leaked and do not present a threat of release. The Superfund was designed to respond to an existing backlog of facilities, not to prevent or delay the occurrence of future releases from facilities. In other words, the Superfund does not come into play until a facility has a release or can be demonstrated to present a substantial threat of a release into the environment.

It is clear, however, that the costs associated with a land disposal facility do not disappear if the facility fails to

qualify for coverage by the PCTLF. Rather, those costs are borne by other parties, including the owner and operator, the Superfund, the States, and the public.

ENDNOTES

1. U.S. Environmental Protection Agency. National Survey of Hazardous Waste Generators and Treatment, Storage, and Disposal Facilities Regulated Under RCRA in 1981. April 1984.

2. U.S. Environmental Protection Agency. National Priorities List, 40 CFR Part 300, App. B. August 1983.

3. 42 U.S.C. 6901 et seq.

4. 42 U.S.C. 9601 et seq.

5. 40 CFR Part 261.

6. 40 CFR Part 262.20-262.23 and 40 CFR Part 263.20-263.22.

7. 40 CFR Part 264 and 40 CFR Part 265.

8. 40 CFR Part 271.

9. National Priorities List, 40 CFR Part 300, App. B. September 1984.

10. Proposed Rule. Federal Register, Vol. 49, No. 200, p. 40320. October 15, 1984.

11. Cong. Rec., Vol. 45, No. 126, S14968. November 24, 1980.

12. Id.

13. Senate Rep. No. 96-848, July 13, 1980. p. 88.

14. Id., p. 90.

15. Id.

16. 40 CFR Part 264.100.

17. Cong. Rec., Vol. 45, No. 234, H11789. December 3, 1980.

CHAPTER 3: METHODOLOGY

Any assessment of the adequacy of the Post-Closure Liability Trust Fund must take into account the fact that both the demands on the PCLTF and the supply of funds to the PCLTF will be the result of events having unknown probabilities of occurrence. EPA has addressed these inherent uncertainties through the development of a computer model that simulates key events and policies related to the PCLTF. This chapter is intended to provide the reader with a very brief overview of the PCLTF Simulation Model and its relationship to the results of this report. For a more thorough overview of the model the reader should refer to Volume I of the accompanying report on the PCLTF Simulation Model; a complete description of the model is contained in Volume III.

The model is the product of a joint effort by two contractors, ICF Incorporated and Battelle Pacific Northwest Laboratories, under the guidance of EPA's Office of Solid Waste. Battelle Pacific Northwest Laboratories developed those aspects of the model and its data base relating to the estimation of the probability and timing of releases from facilities; ICF Incorporated developed all other portions of the model.

3.1 General Approach

EPA chose to develop a computer model of the PCLTF in response to the complexities and uncertainties of future events at hazardous waste disposal facilities. A computer model allows EPA to take into account differences in facility design, operation, and location; to model uncertainties in future economic conditions and legal or policy matters; and to put to use large data bases

that could not be used without a computer. In the context of this report, the results produced by the model reflect the uncertainties in the future revenue and expenditures of the PCLTF. The annual estimates of the Fund balance are not point estimates; instead, they are distributions of possible outcomes that are described by various statistics (mean, median, standard deviation). Thus, the model does not attempt to predict with certainty what the PCLTF balance will be in any given year, but it does allow the user to assess the probability that future revenues will be adequate to meet the obligations of the Fund. The stochastic or probabilistic characteristics of the model are discussed further in section 3.2.

In developing the structure of the model, EPA sought to make it possible to test both the effects of various alternative assumptions regarding technical and policy matters and the implications of alternative data bases. Each run of the model has associated with it a set of assumptions and policies that is provided as input. The results of a model run are therefore associated with a particular set of inputs, and the implications of adopting one policy or set of assumptions about the future as opposed to another can be identified by changing the inputs.

3.2 Stochastic Simulation

The PCLTF Model is a stochastic simulation model; that is, key aspects of the model are simulated using probability distributions and random numbers. Such a model is often referred to as a "Monte Carlo" model.

A single run of the model is made up of numerous iterations, or

sequential operations of the model under the same set of assumptions. During each iteration, the model performs all of the calculations necessary to estimate the PCLTF balance for each year for 100 years into the future. The results of the iterations may vary widely because they depend on the random numbers that are generated in the model. The results of each iteration in a model run are statistically independent, equally likely observations. Each iteration is analogous to a strictly controlled experiment, and the results of the numerous iterations can be combined into an expected distribution of PCLTF balances over time.

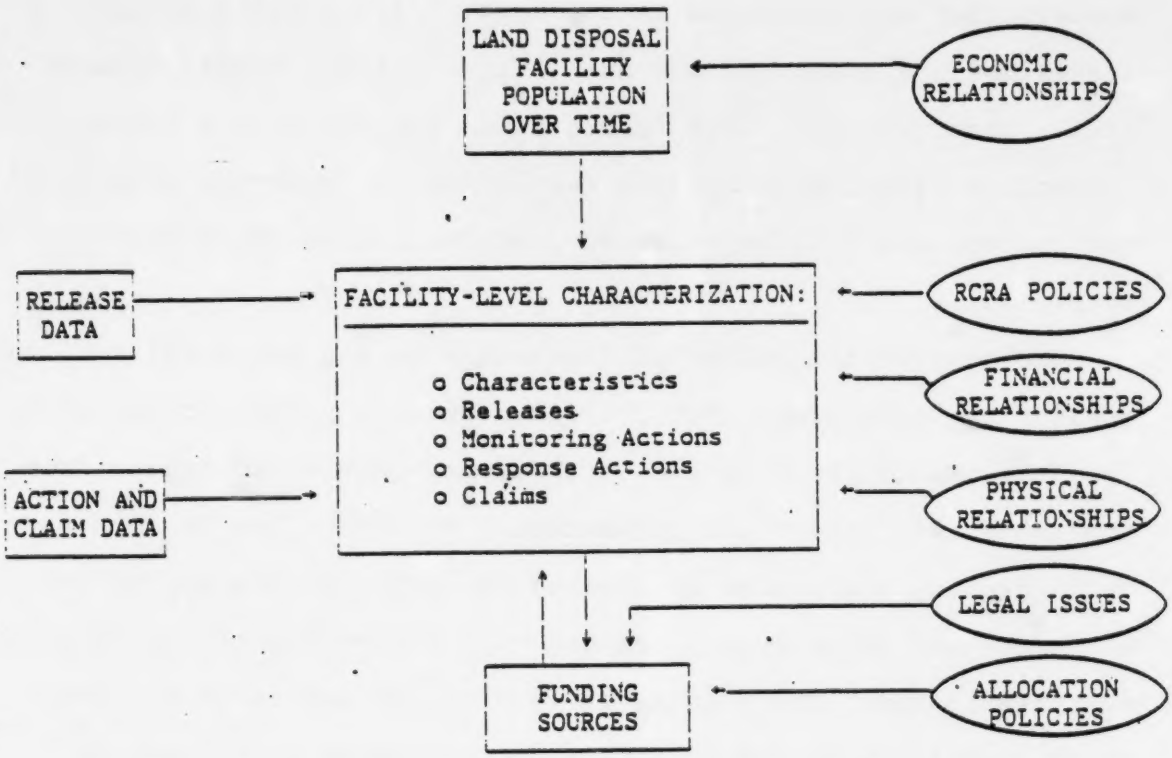
The greater the number of iterations in a given model run, the greater the confidence that the distributions generated as model output resemble the actual distributions which would result from the model assumptions and parameters. Estimates can be improved by increasing the number of iterations, but the accuracy of the estimates can never exceed the underlying accuracy of the measurement techniques. The results in this report are based on runs of 29 iterations, a sample generally considered sufficient to describe many random processes.

3.3 Description of the Model

The PCLTF Simulation Model brings together complex and interrelated factors which influence the revenue, expenditures, and balance of the Fund. One way to understand the model analysis is to divide these factors into two types: Basic Model Units and Relationships Among Basic Units. Exhibit 3-1 displays a simplified representation of these two types of Model factors.

EXHIBIT 3-1

SIMPLIFIED REPRESENTATION OF THE PCLTF SIMULATION MODEL ANALYSIS [1]



[1] Rectangles display Basic Model Units. Ovals display the relationships among the Basic Model Units.

The Basic Units (represented in the exhibit with rectangular boxes) include:

- Facility Population;
- Facility-Level Characterization;
- Release Data;
- Action and Claim Data; and
- Funding Sources.

The values estimated for each of these Basic Units are influenced by the Relationships among them (represented with ovals), which include:

- Economic Relationships;
- RCRA Policies;
- Financial Relationships;
- Physical Relationships;
- Legal Issues; and
- Allocation Policies.

As displayed in Exhibit 3-1, the PCLTF Model Analysis proceeds as follows:

- The estimate of the population of land disposal facilities over time is based on economic relationships describing the supply and demand for land disposal of hazardous waste.

- For each facility in the facility population, a Facility-Level Characterization is performed which estimates a series of characteristics (such as facility size and design). Based on these characteristics and the Release Data, the facility's potential releases are simulated.

- The estimated releases at a facility are an important driving influence of the Facility-Level Characterization. In conjunction with RCRA Policies and Physical Relationships, the estimated releases lead to monitoring actions, response actions, and claims.

- The viability of the firm that owns the facility is dependent on the financial relationships among the firm's net worth, total assets, and expenditures for monitoring and response actions and claims. A firm's bankruptcy will lead to the closing of its operating facilities and the allocation of incurred costs to other funding sources.

- The costs of the actions and claims estimated at the Facility Level are allocated to the available Funding

Sources according to specified Allocation Policies. The PCLTF is one of the potential Funding Sources available to cover costs which arise at the Facility Level. Various Legal Issues regarding the validity of third-party claims play a role.

- An important feedback exists between Funding Sources and the Facility-Level Characterization. If no Funding Source is available for a monitoring or response action, then the action is not taken. This feedback is important because a response action can prevent additional releases from occurring at a facility. Consequently, not having a Fund Source for certain actions may lead to additional numbers of releases.

The population of land disposal facilities considered in the PCLTF Simulation Model includes those facilities with the following land disposal processes: surface impoundments; landfills; land treatment; and injection wells. However, injection wells and land treatment facilities are modeled only as part of the available supply of disposal capacity and as sources of revenue. No releases of hazardous waste from these two processes are modeled because very little information is available with which to characterize their potential releases. Moreover, a land treatment facility can receive a final RCRA permit only if the treatment program can degrade, transform, or immobilize hazardous constituents within the treatment zone. To the extent that injection wells and land treatment facilities covered by the Fund would create significant claims, the model underestimates the future expenditures of the PCLTF.

For surface impoundments and landfills the model simulates six types of releases. These six release types, presented in Table 3-1, are defined in terms of: (1) The location at which the release is detected; and (2) The concentration of hazardous

Table 3-1
Six Release Types Defined in Terms of
Location and Concentration

Release Type	Location	Concentration
1	On-site monitoring well	Change in indicator parameters
2	On-site monitoring well	Detectable concentration of constituents
3	On-site monitoring well	Toxic concentration of constituents
4	Closest off-site potable well or naturally occurring body of surface water	Detectable through taste and odor
5	Closest off-site potable well or naturally occurring body of surface water	Detectable concentration of constituents
6	Closest off-site potable well or naturally occurring body of surface water	Toxic concentration of constituents

constituents in the ground or surface water at the point of detection. A seventh type of release, the overflow of contaminated leachate from the facility (often referred to as the "bathtub" effect because it resembles a bathtub overflowing), was modeled in the release simulation but was found not to occur.

The release types were selected in order to model the process of detecting and responding to releases from facilities. Each release type could be detected by one or more monitoring actions which may be undertaken at the facility. In addition, the detection of each release type may lead to a particular set of monitoring actions, response actions, and claims.

The model tracks and allocates the costs associated with monitoring actions, response actions, post-closure care, and claims. The five possible monitoring actions are as follows:

- Routine monitoring for indicator parameters at the on-site monitoring well;
- Monitoring for hazardous waste constituents at the on-site monitoring well;
- Plume delineation and tracking on site;
- Monitoring for hazardous constituents off site; and
- Plume delineation and tracking off site.

The model also simulates the following three types of response actions:

- Cap repair;
- Fluid removal and treatment on site; and
- Fluid removal and treatment off site.

Finally, claims are brought by third parties who believe they have been harmed by an off-site release. The types of claims are:

- Personal injury (medical costs, health monitoring costs, and lost wages due to disability or premature death);
- Real property damage (diminished value of housing and farmland near the location of the off-site release);
- Economic loss (the capital cost of replacing a contaminated source of drinking water); and
- Natural resource damage (the costs of restoring small areas of contaminated surface water, the value of lost recreation for one year, and the commercial value of potential fish kills).

EPA's estimate of personal injury claims does not include awards for pain and suffering, loss of consortium, or punitive damages. In addition, lost time due to disability or premature death is valued in the model only in terms of lost wages. Finally, only a very limited range of possible natural resource damages, with relatively low dollar values, is examined; by contrast, 4 states (New Jersey, Idaho, South Dakota, and Colorado) have asserted a total of 56 natural resource damage claims for approximately $2.7 billion against the Superfund, although the validity of those amounts has not been demonstrated. Thus it is likely that the model underestimates the size of claims, although the extent to which it does so is uncertain.

Costs are allocated by the model to responsible parties, including the owner or operator (either directly or through a financial assurance mechanism), the PCLTF, the Superfund, and States. The model user can specify the order of allocation to these parties for each type of action or claim during different periods of the facility operating life and post-closure period. The costs allocated to the PCLTF determine the expenditure side of the PCLTF balance sheet.

The Fund's tax revenues are calculated based on an estimate of the dry-weight portion of the waste currently going to land disposal. Interest revenue is earned on any positive balance in the Fund, and interest is paid on any money borrowed by the PCLTF. Although CERCLA limits borrowing by the Fund to $200 million, no limit on borrowing was imposed in the model. Unlimited borrowing was assumed so that the full extent of the PCLTF's future obligations could be evaluated. Finally, the model does not simulate recovery actions that may be taken against generators or other liable parties on behalf of the PCLTF. The importance of generators as a funding source depends, in part, on the interpretation of the transfer of liability to the PCLTF and the policies of cost recovery undertaken by EPA. Insofar as EPA is able to recover PCLTF expenditures from generators, the PCLTF balances may be underestimated by the model.

The PCLTF balance is calculated for each year of a simulation run by subtracting from the balance of the previous year the current year expenditures for monitoring, response actions, post-closure care, claims, and interest payments, and adding the tax and interest revenue from the current year. This calculation is performed for each year for each of the 29 iterations of a simulation run; the 29 estimates form a distribution reflecting the uncertainties surrounding the various factors influencing the PCLTF.

3.4 Methodological Issues and Limitations

The PCLTF Simulation Model provides the user with a flexible tool for examining the adequacy of the Fund and for evaluating

the sensitivity of the results to changes in PCLTF policies, facility designs, patterns of hazardous waste disposal, economic conditions, and a variety of other factors. However, it is important to understand the purpose and limitations of the model.

The model was developed to simulate the performance of a population of facilities and to estimate the potential distribution of the PCLTF balance over time. Therefore, the model is not meant to be used to evaluate the anticipated performance of individual facilities. In order to examine an individual facility, detailed data about that facility would have to be collected and put into a form the model could use. The Agency will not use the model to associate costs or claims with specific facilities.

In addition, the model does not assess the risk to human health which may result from releases at hazardous waste facilities. Rather, personal injury claims are based on the size of the exposed population and the background rate of certain diseases in the population. Therefore, the model does not estimate the number of additional illnesses or deaths caused by a release. Claims can be brought for medical monitoring costs (reflecting increased potential for illness) or for illness or death that could have resulted from a release or from a variety of other causes. This approach was adopted because it may be difficult or impossible for the courts or the Fund administrator to distinguish between those injuries actually caused by a release and those arising from other causes. The reader should refer to Volume III, Section A.2.5.1 of the report on the PCLTF Simulation Model for a thorough description of the method used to

estimate personal injury claims.

Beyond the limitations imposed by the purpose of the model, the reader should keep in mind the following major limitations and assumptions which reflect either the quality of the data available or the need to make simplifying assumptions for modeling purposes:

(1) The model assumes that no feedback exists between the potential harm which would result from a release at a particular facility and the degree of care exercised in designing, operating, monitoring, and maintaining that facility. For instance, the model does not assume a safer design or more stringent monitoring for a facility from which a release would contaminate a major source of drinking water.

(2) The model does not take into account incentive effects attendant to changes in PCLTF policies. In other words, the model works on the assumption that a change in a PCLTF policy will not cause any change in the incentives for owners and operators to design and operate their facilities properly. Although this assumption may be unrealistic, there does not appear to be any simple, appropriate way to model the changes in incentives that would be associated with changes in PCLTF policies.

(3) The model does not attempt to anticipate future trends in facility design and state or federal regulations, statutes, or common law. Although the model uses a different distribution of designs for new facilities as compared with existing facilities, no new designs are introduced.

(4) The release simulation does not take into account extreme weather conditions, human intrusion at disposal facilities, movement of contaminants from one aquifer to another, or releases from injection wells and land treatment facilities.

(5) Ground-water monitoring is assumed to detect 75 percent of on-site releases.

(6) Response actions are assumed to be required whenever detectable concentrations of hazardous constituents are found in the ground water (although a response action is not taken if no responsible party is available to pay for it).

(7) PCLTF revenues are estimated assuming that the PCLTF tax as well as the Fund's borrowing authority are reauthorized, and that there is full compliance with the tax.

(8) Generators and other liable parties are not included as a potential funding source for costs arising at land disposal facilities. If generators were held liable for a portion of these costs, it would not only change the distribution among funding sources (e.g., the owner or operator, PCLTF, Superfund) but could also influence the amount of hazardous waste generated and placed in land disposal facilities.

This list is by no means exhaustive, and it is advisable for the reader to study the complete description of limitations and caveats included in Volume I, Chapter 6 of the report on the PCLTF Simulation Model.

CHAPTER 4: ASSESSING PCLTF ADEQUACY

Central to the purpose of this Report is the evaluation of the "adequacy" of the Post-Closure Liability Trust Fund. However, the PCLTF Simulation Model discussed in the previous chapter does not provide as output a determination that the Fund is adequate or that it is inadequate. What is "adequate" or "inadequate" depends on the importance one places on being certain that the Fund will be able to pay all claims against it at all times. Each reader will approach the subject with a different view of what constitutes "adequacy" and of the importance of the adequacy of the PCLTF over time. This chapter introduces some of the factors involved in assessing the adequacy of the Fund, discusses several measures of adequacy, and describes how to apply those measures to the output of the PCLTF model.

4.1 The Concept of Adequacy

The first and perhaps most important factor in evaluating the adequacy of the PCLTF is that there is no way to determine with certainty what the revenues and expenditures will be. Any evaluation of the adequacy of the PCLTF should be based, as is the PCLTF Simulation Model, on a range of possible outcomes. Adequacy therefore becomes probabilistic; given a certain set of assumptions, it is not possible to say with absolute certainty what the Fund balance will be in a given year, but it is possible to estimate the probability that the Fund balance will exceed a certain level (e.g., $200 million) or that revenues will exceed expenditures in a given year.

A second factor which complicates the concept of adequacy is that revenues and expenditures vary over time. During some time periods, revenues may clearly exceed expenditures. However, this will not always be the case. A few large claims against the Fund could exceed revenues from taxes and interest over a period of time. If this depletion lasts only a short while, it might not threaten the adequacy of the Fund, but if expenditures continue to mount and continue to exceed revenues even when the tax is being collected, the adequacy of the Fund would be in doubt. Therefore, while it is not necessary that revenues exceed expenditures in all time periods, the Fund must be able to recover from periods of depletion.

The final complicating factor is that extremely large Fund balances may be undesirable. While it is clearly desirable for the Fund to maintain a positive balance of unobligated funds as a buffer against uncertainty, a larger fund balance is not necessarily better than a smaller one. At some point, the marginal costs to society of maintaining a larger pool of captive funds would exceed the marginal benefits that the larger Fund balance would provide. Money in the PCLTF cannot be spent for any other public or private purpose, no matter what the value to society.

4.2 Alternative Measures of Adequacy

Three possible approaches to assessing the adequacy of the PCLTF are presented as examples; EPA recognizes that assessing the adequacy of the PCLTF is an inherently subjective task and that each reader will approach the matter differently.

4.2.1 Irreversible Depletion of the Fund

This definition of adequacy can be applied by inspecting the output of the PCLTF Simulation Model (contained in Volume II of the report on the model) and answering the question, "Does the PCLTF balance become negative and remain negative?". A negative balance from which the Fund does not recover is a clear indicator of inadequacy. The probabilistic nature of the output also allows the reader to define inadequacy in terms of the probability that the balance in the PCLTF will be negative in a given year. In other words, the Fund might be judged inadequate not only if the median balance becomes negative but if there is a 10 or even 5 percent chance that the balance will fall below zero.

This simple approach is both intuitively appealing and particularly easy to apply given the nature of the model's output. The discussion of the model results in Chapter 5 therefore addresses the issue of adequacy in terms of the Fund's ability to maintain a positive balance over the 100-year period of the simulation runs.

4.2.2 Depletion of PCLTF Below Minimum Level

A somewhat more cautious approach to adequacy would be to set some positive level of Fund balance as the minimum acceptable Fund balance and determine the level of certainty that is desired. Unlike the previous definition, this measure of adequacy incorporates a safety margin or a buffer against uncertainty. For instance, if the reader chooses $50 million as a minimum acceptable Fund balance and 90 percent as the desired level of certainty,

then the output of the model should be examined to determine when and how frequently the ninetieth percentile of the Fund balance drops below the $50 million level.

The minimum acceptable Fund balance also could increase over time if a larger buffer is desired to compensate for inflated costs and increased uncertainty. This minimum adequate Fund balance could be increased linearly (i.e., by a constant amount each year) or exponentially (e.g., indexed to an expected rate of inflation). The buffer could also be tied directly to Fund expenditures; in other words, an "adequate" Fund balance could be defined as an amount equal to that expended by the PCLTF over a given number of years.

4.2.3 Comparison of the Present Value of Expenditures and Revenues

In this approach all revenues and expenditures are discounted back to their present value and then compared. The discount rate represents the rate at which current income is preferred to future income, and future expenses are preferred to current expenses. However, if the discount rate chosen is greater than the real rate of return (the interest rate minus the inflation rate), then revenues from the early years will mask expenditures in the later years.

In the first several years after the tax goes into effect, the PCLTF will expend little if any money because there will be a lag of several years before the first land disposal facilities with final RCRA permits close and are subsequently able to qualify for coverage by the Fund. Revenues during this period would not be

greatly discounted, whereas large expenditures far in the future would be heavily discounted. For instance, if a discount rate of 5 percent is used, one dollar of revenue in the first year has the same present value as 132 dollars expended by the PCLTF in year 100.

4.3 Use of Model Results

The output from the PCLTF Simulation Model can be employed in any of the measures of adequacy discussed above. For the simple measure (e.g., when adequacy is equated with the balance remaining positive over a certain period of time), inspection of the graph of the unobligated Fund balance may be sufficient for evaluating the adequacy of the PCLTF. Each graph includes six different lines, corresponding to the minimum, maximum, mean, median, tenth percentile, and ninetieth percentile observations of the balance of the Fund in each of the 100 years. The judgment as to the adequacy of the PCLTF may depend on which of these lines the reader uses.

More sophisticated analyses of adequacy can be performed using the printed output file (see Volume II of the report of the PCLTF Simulation Model), which provides the mean, median, tenth percentile, and ninetieth percentile observations of the Fund balance, revenues, and expenditures in each year of the simulation. The output file and its interpretation are described in more detail in Chapter 5 of this report and in Volume I, Chapter 4 of the PCLTF Simulation Model Report.

Using data from the output file, it is possible to evaluate

more precisely the Fund balance as well as both the revenues and expenditures of the PCLTF. Since the output file provides values for each year of the Fund balance, measures of adequacy can be applied over the time horizon of the simulation or between different time periods. In addition, adequacy can be evaluated at different levels of certainty.

CHAPTER 5: SIMULATION RESULTS

This section discusses the results of four simulations or "runs" of the PCLTF Simulation Model. Simulation 1 ("Current Statute") reflects EPA's current view of the most likely policies for implementing the Fund (based on the statutory language and assuming that the tax authority does not expire on September 30, 1985) and can be thought of as the "Base Case." Simulation 2 is identical to the Base Case except that it assumes a more rapid decrease in the amount of hazardous waste going to land disposal facilities. The reader should note that, with the enactment of restrictions on land disposal as part of the Hazardous and Solid Waste Amendments of 1984, the simulation that assumes a rapid decrease in the demand for land disposal is now a more accurate representation of the possible future revenues and expenditures of the PCLTF than is the Base Case. The other two runs are referred to as "policy simulations" because they differ from the Base Case only with regard to one or more of the PCLTF policies. All estimates of physical phenomena (i.e., releases) and costs are the same for all of the simulations.

This chapter is in most respects similar to Volume I, Chapter 4 of the report on the PCLTF Simulation Model, except that this chapter does not describe each table of the Base Case results. The major assumptions common to all of the simulations are presented first. The Base Case simulation is then described and the results of that simulation are discussed. Each of the three other simulations is described in turn and the results summarized. However, only the graphs of the PCLTF balance for each simulation are presented in this section. The complete set

of results for all four simulations is contained in Volume II of the PCLTF Simulation Model Report. Finally, the PCLTF's relative share in the future costs of land disposal is evaluated by comparing the allocation of costs to responsible parties in the Base Case with the allocation that would occur in the absence of the PCLTF.

5.1 Major Assumptions

The following major assumptions are incorporated into all of the simulations:

- Initial Facility Population -- The initial facility population incorporates all existing interim-status land disposal facilities with the following processes: surface impoundment (storage, treatment, and disposal); landfill; land treatment; and injection well. The size of the initial facility population, estimated using the most recent data on land disposal facilities compiled by EPA, is approximately 980 facilities nationwide.

- Addition of New Facilities to the Population -- New facilities are added to the facility population as additional land disposal capacity is required to meet the demand for land disposal. Additional capacity is required over time because existing facilities are simulated to close.

- Demand for Land Disposal -- The demand for land disposal is assumed to decrease at an annual rate of 2 percent over the first 50 years of the simulations, except for Simulation 2, in which the demand for land disposal is assumed to decrease by 50 percent over the first 10 years, and then decrease by 2 percent per year for the next 40 years.

- Facility Characterization -- Existing facilities in the facility population are characterized according to the most recent population data obtained by EPA. New facilities are simulated to conform with the land disposal regulations promulgated by EPA and are assumed to have better locations than existing facilities (in terms of the likelihood of releases and potential exposure to contaminated ground water).

- RCRA Policy Regarding Facility Permits -- Final RCRA permits are assumed to be granted or denied to all existing facilities within the next five years. Any facility may be

granted a permit regardless of the evidence of releases that may have occurred. However, it is assumed that 25 percent of existing facilities will close rather than obtain final operating permits. This 25 percent is chosen randomly in each iteration. All new facilities open with permits.

- RCRA Policies Regarding Monitoring and Response Actions -- All facilities are simulated to undertake detection monitoring and, when necessary, compliance monitoring as required by the current land disposal regulations. The owner or operator is also required to undertake off-site monitoring and response actions.

- Third-Party Claims -- Third-party claims are simulated in response to off-site releases only. The legal validity of third-party claims is simulated to reflect current state and federal statutory and common law; however, claims for pain and suffering, loss of consortium, and punitive damages are not considered.

5.2 Simulation 1: Current PCLTF Statute

5.2.1 Definition of Simulation 1

For purposes of defining Simulation 1 (the Current PCLTF, or "Base Case"), EPA has made numerous assumptions about policies regarding the implementation of the Fund. The PCLTF policies for the Base Case are listed in Table 5-1 and are discussed below. Appendix D of the report on the PCLTF Simulation Model (Volume III) presents all of the inputs used in the simulation. The assumptions used here do not necessarily represent future EPA policies. Instead, the Model should be viewed as a tool to assist in the development of future policies regarding the long-term liabilities of hazardous waste management facilities.

Qualification for PCLTF Coverage: In order for a land disposal facility to qualify for coverage by the Fund, it must meet the conditions listed in Table 5-1. Section 107(k) of CERCLA establishes the requirements that a facility receive a final permit and be monitored for up to five years after closure. The demonstration of "no substantial likelihood" of migration off site, release from confinement, or risk to public health required by

Table 5-1

PCLTF Policies in the Base Case

- Qualification for PCLTF Coverage

  -- Final RCRA permit received
  -- Qualification monitoring period of five years from date of closure
  -- No releases detected prior to the end of the five-year monitoring period
  -- Financial assurance for post-closure monitoring and maintenance remains active throughout the five-year qualification period

- Fund Coverage at Qualified Facilities

  -- All third-party claims
  -- Non-routine monitoring and response actions (including corrective actions) only following the post-closure period
  -- Routine monitoring and care following the post-closure period

- Fund Revenues

  -- Tax of $2.13 per dry-weight ton fixed in nominal dollars
  -- Fund ceiling of $200 million fixed in nominal dollars
  -- Fund earns 5.1 percent nominal interest on any positive Fund balance
  -- Fund has unlimited borrowing authority (different from statute)
  -- No sunset on tax and borrowing authority

CERCLA is interpreted in the Base Case as requiring that no release be detected prior to the end of the five-year period of monitoring. This means that any release detected prior to this time (including during operation) would disqualify a facility from Fund coverage. Finally, the financial assurance requirement listed in Table 5-1 is included to reflect the CERCLA provision requiring that the facility comply with all RCRA regulations which may affect the performance of the facility after closure (CERCLA section 107(k)(1)(A)).

Fund Coverage at Qualified Facilities: The PCLTF is authorized to cover costs of monitoring, response, and claims established in CERCLA or any other state or federal law (CERCLA Section 111(j)). Consequently, PCLTF coverage in the Base Case includes all third party claims immediately following the transfer of liability to the Fund. Response costs and routine monitoring and care (including detection monitoring, compliance monitoring, and post-closure care such as security and leachate collection) are assumed to remain the responsibility of the owner and operator throughout the post-closure period. The Fund covers these costs only following the facilty's post-closure period.

Superfund Coverage: At facilities which do not qualify for the PCLTF and at which neither the owner/operator nor a financial assurance mechanism is available, the Superfund is simulated to be available to finance certain costs. These costs include non-routine monitoring and response actions and natural resource damages.

Fund Revenues: Fund revenues come from a tax of $2.13 per dry-weight ton of disposed hazardous waste. This tax is fixed in nominal terms, as is the Fund ceiling of $200 million. The total amount of disposed waste is assumed to decrease at an annual rate of 2 percent for the first 50 years of the simulation; therefore the potential annual revenue from the PCLTF tax decreases at the same rate. The Fund may also obtain revenues by investing the positive Fund balance in federal securities. A nominal rate of return of 5.1 percent per year is used.

5.2.2 Interpretation of the Results

The complete results of the Base Case simulation and of the three other simulations are presented in graphs and tables contained in Volume II of the accompanying report on the PCLTF Simulation Model. For a complete description of the tables comprising the Base Case results, the reader should refer to Chapter 4 of the Simulation Model report (Volume I).

All of the simulations described in this report were based on runs of 29 iterations. This means that each run is composed of 29 separate estimates of each quantity (revenues, expenditures, balance, etc.) for each year of the simulation. These 29 estimates form a distribution reflecting the uncertainties surrounding the various factors influencing the PCLTF. In the graphs presented in this report, the distributions are described in terms of the following statistics:

- Minimum -- the smallest of the 29 values observed.
- Tenth percentile -- the value below which 10 percent of the observations fall. For 29 observations, the third smallest observation is the tenth percentile.
- Median -- the value for which there is a 50 percent chance of an observation falling either above or below it. For 29 observations, the fifteenth observation is the median.
- Ninetieth percentile -- the value below which 90 percent of the observations fall. For 29 observations, the 27th observation is the ninetieth percentile.
- Maximum -- the largest of the 29 observations.
- Mean -- the average of the 29 observations.

These statistics are represented as separate lines on the graphs of the Fund balance presented in this section. The graphs present estimates of the unobligated PCLTF balance over time (100 years, with the exception of graph 1-1). The horizontal axis is time, beginning with year 1 which is fiscal year 1984. The unobligated balance (in millions of dollars) is displayed on the vertical axis; the scale of the vertical axis differs from one graph to the next so that the most extreme value of the Fund balance can be included in each case. The unobligated balance is relevant because it is the unobligated balance which triggers the

collection of the tax (CERCLA section 231). The unobligated balance equals the total balance minus obligations; for purposes of these simulations, obligations are defined as the average of the Fund's expenditures over the previous three years. However, the model offers several options for defining obligations.

Finally, the reader should keep in mind that although CERCLA limits the PCLTF's borrowing to $200 million, no limit on borrowing was incorporated into the simulations. EPA has modeled the PCLTF in this manner so that the full extent of the Fund's obligations could be included in the assessment of PCLTF adequacy.

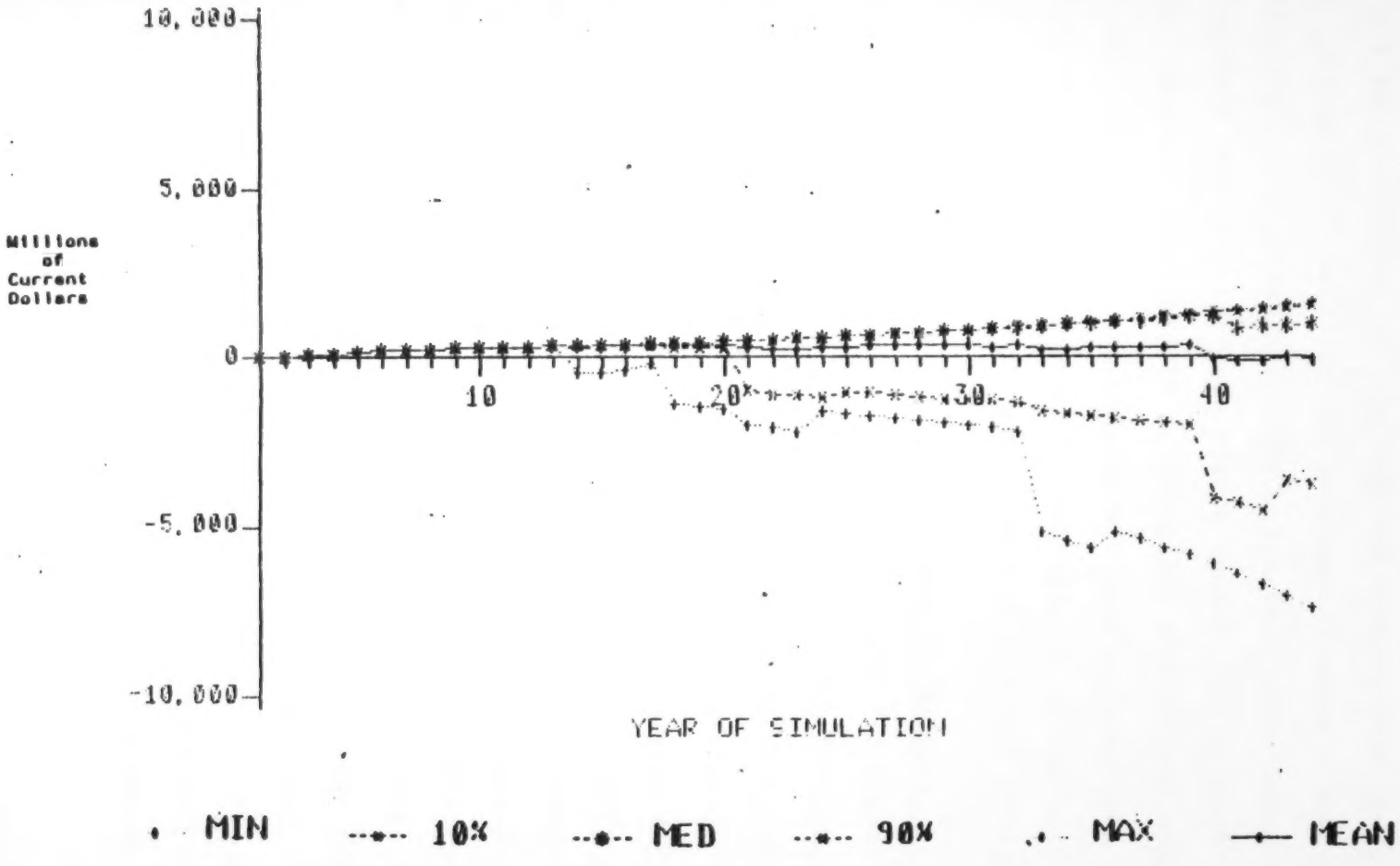
5.2.3 Results of Simulation 1

Graph 1-1 displays the distribution of the unobligated PCLTF balance (in millions of current year dollars) over the first 44 years of the Model analysis. This allows the reader to differentiate between the six different lines in the early years of the analysis. Starting from the bottom line in year 44 the six lines are the minimum, tenth percentile, mean, median, ninetieth percentile, and the maximum (the latter two overlap in this graph). These six lines show that in the worst case (the minimum observation) the PCLTF balance may become and remain negative by year 14. The tenth percentile estimate of the Fund balance is negative after year 21, and the mean becomes negative in year 40, returns to a positive balance in year 43, and is negative thereafter. The median, ninetieth percentile, and maximum observations remain positive throughout the period covered in this graph.

Graph 1-2 presents the results of Simulation 1 over the

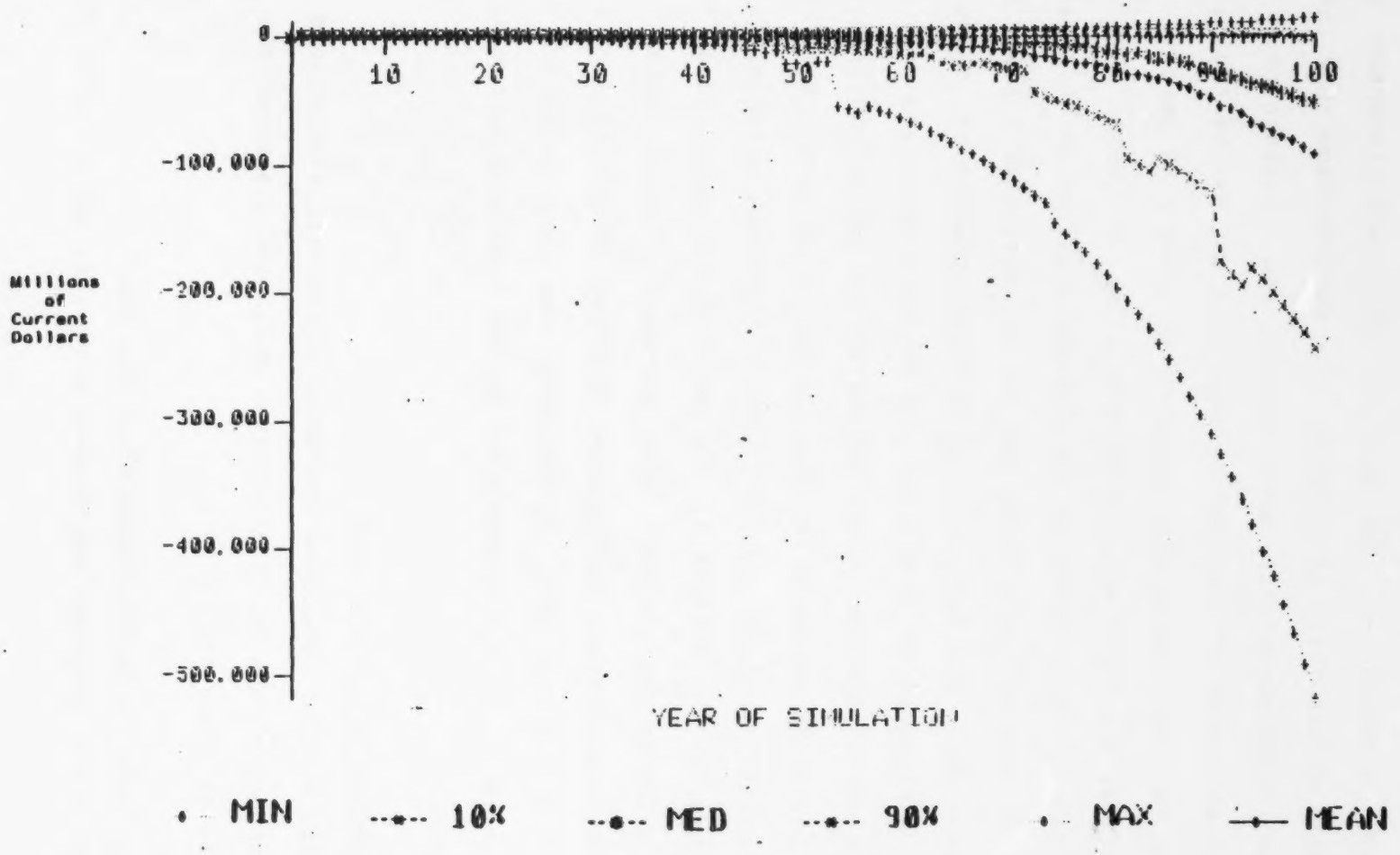
GRAPH I-1

UNOBLIGATED FUND BALANCE IN MILLIONS OF CURRENT DOLLARS
FOR SIMULATION I:
CURRENT PCLTF STATUTE



GRAPH I-2

UNOBLIGATED FUND BALANCE IN MILLIONS OF CURRENT DOLLARS
FOR SIMULATION I:
CURRENT PCLTF STATUTE



100-year period. The first 44 years are identical to those presented in Graph 1-1. The same six values are presented, only the scale of the graph is changed. The results show that the minimum, tenth percentile, mean, median, and ninetieth percentile estimates of the Fund balance have all become negative by year 99. This means that there is at least a 90 percent chance that the PCLTF will be in debt after 100 years. The worst case is represented by the minimum observation which shows a debt of over $22 billion by year 50 and over $500 billion by year 100, while the best case, or maximum observation, shows positive balances of $2 billion and $13 billion in years 50 and 100, respectively. However, these values are in nominal dollars; thus, inflation accounts for most of the range in the Fund balance.

The results of Simulation 1 and of the other three simulations are summarized in Table 5-2. For each of the simulations, the table presents the minimum, tenth percentile, mean, median, ninetieth percentile, and maximum observations of the Fund balance in year 50 and year 100. In addition, the table notes the first year in which a given observation of the Fund balance becomes negative.

5.3 Additional Simulations

This section describes the three additional simulations performed with the PCLTF Simulation Model and discusses the results of those simulations.

5.3.1 Description of Additional Simulations

Table 5-3 displays how Simulations 2, 3, and 4 differ from

Table 5-2
Summary of PCLTF Simulation Results*

Simulation	Minimum	Tenth Percentile	Mean	Median	Ninetieth Percentile	Maximum
1. Current PCLTF Statute						
First year of negative balance	14	21	40/44**	56	99	100+
Balance in year 50	-22.60	-10.72	-1.72	0.24	2.05	2.09
Balance in year 100	-500.10	-244.95	-92.11	-51.86	-0.26	12.71
2. Partial Land Disposal Ban						
First year of negative balance	14	21	30	51	100+	100+
Balance in year 50	-14.03	-9.56	-1.65	0.53	1.82	1.84
Balance in year 100	-350.05	-254.37	-87.65	-59.31	6.00	11.53
3. Coverage of Corrective Action During Post-Closure Period						
First year of negative balance	14	21	44	56	80	100+
Balance in year 50	-27.02	-12.04	-1.93	0.31	1.76	1.88
Balance in year 100	-570.00	-249.25	-103.72	-65.50	-9.46	10.08
4. No PCLTF Coverage of Third Party Claims						
First year of negative balance	84	90	100+	100+	100+	100+
Balance in year 50	1.62	1.92	2.01	2.04	2.08	2.10
Balance in year 100	-10.84	-5.45	8.59	12.10	15.67	16.81

* Fund balances are in billions of current year dollars.
** Fund balance drops below zero, recovers, and then becomes negative again

Table 5-3
Summary of Simulations
(differences from Simulation 1)

Policy	Simulation 1: Current PCLTF Statute	Simulation 2: Partial Ban	Simulation 3: Coverage of Corrective Action	Simulation 4: Liability Claims Not Covered
Qualification				
Monitoring period	5 years			
Releases	None allowed			
Financial Assurance	Must be adequate during 5-year monitoring period			
RCRA Permit Required	Yes			
Coverage				
Routine Monitoring and Care	After post-closure period			
Non-Routine Monitoring and Response	After post-closure period		After qualification (5 years)	
Third-Party Claims	After qualification (5 years)			Not covered
Fund Revenues				
Tax and ceiling	Fixed in nominal terms			
Waste Volume	Decreases by 2% per year for first 50 years	Decreases by 50% over first 10 years, 2% per year for next 40 years		

the Base Case, Simulation 1. These differences relate to Fund coverage and waste volume. Only the aspects of the simulations which differ from the Base Case are presented in the table. A blank space in the table indicates that the same assumption was used for both the policy simulation and the Base Case. The policy simulations are as follows:

Simulation 2 -- Partial Ban on Land Disposal: This simulation examines the effect on the PCLTF of a large and rapid decrease in land disposal such as might result from the restrictions on land disposal required in the 1984 RCRA amendments. In Simulation 1, the amount of waste being placed in land disposal facilities is modeled to decline by 2 percent per year over the first 50 years of the Model analysis. In Simulation 2, the amount decreases by 50 percent over the first 10 years, and then decreases at an annual rate of 2 percent over the next 40 years. As was mentioned above, this should be considered a more accurate representation of probable future waste volumes than the assumption used in Simulation 1.

Simulation 3 -- Corrective Action Covered After Qualification: In Simulation 3, the PCLTF covers all costs of non-routine monitoring and response from the time a facility qualifies for coverage (five years after closure).

Simulation 4 -- Liabilities Not Covered by the Fund: Simulation 4 excludes third-party liabilities (personal injury, economic loss, property damage, and natural resource damages) from PCLTF coverage. (EPA recognizes that such claims are covered under the existing statute). In this simulation, claims costs are allocated to owners, operators, and State funds, as they are available. As in Simulation 1, the PCLTF does not assume the costs of long-term monitoring, care, and response until the end of the post-closure period, so although a facility still qualifies for coverage 5 years after closure (if it meets the other requirements), no costs are covered by the Fund until at least 30 years after closure.

5.3.2 Results of Additional Simulations

Simulation 2 -- Partial Ban on Land Disposal

The assumption that the amount of land disposal will decrease rapidly has two important effects on the results of the simulation. First, the greatly decreased demand for land disposal results in

the creation of fewer new facilities. This will tend to reduce the future expenditures of the PCLTF by reducing the number of facilities potentially covered by the Fund, although since new facilities are modeled to be safer than existing ones, the reduction in expenditures is not dramatic. Second, the potential annual revenue from the PCLTF tax will decrease more rapidly than in Simulation 1. Thus, at the end of the first 50 years of the simulation, the potential annual revenues of $38 million in Year 1 are reduced to about $8 million.

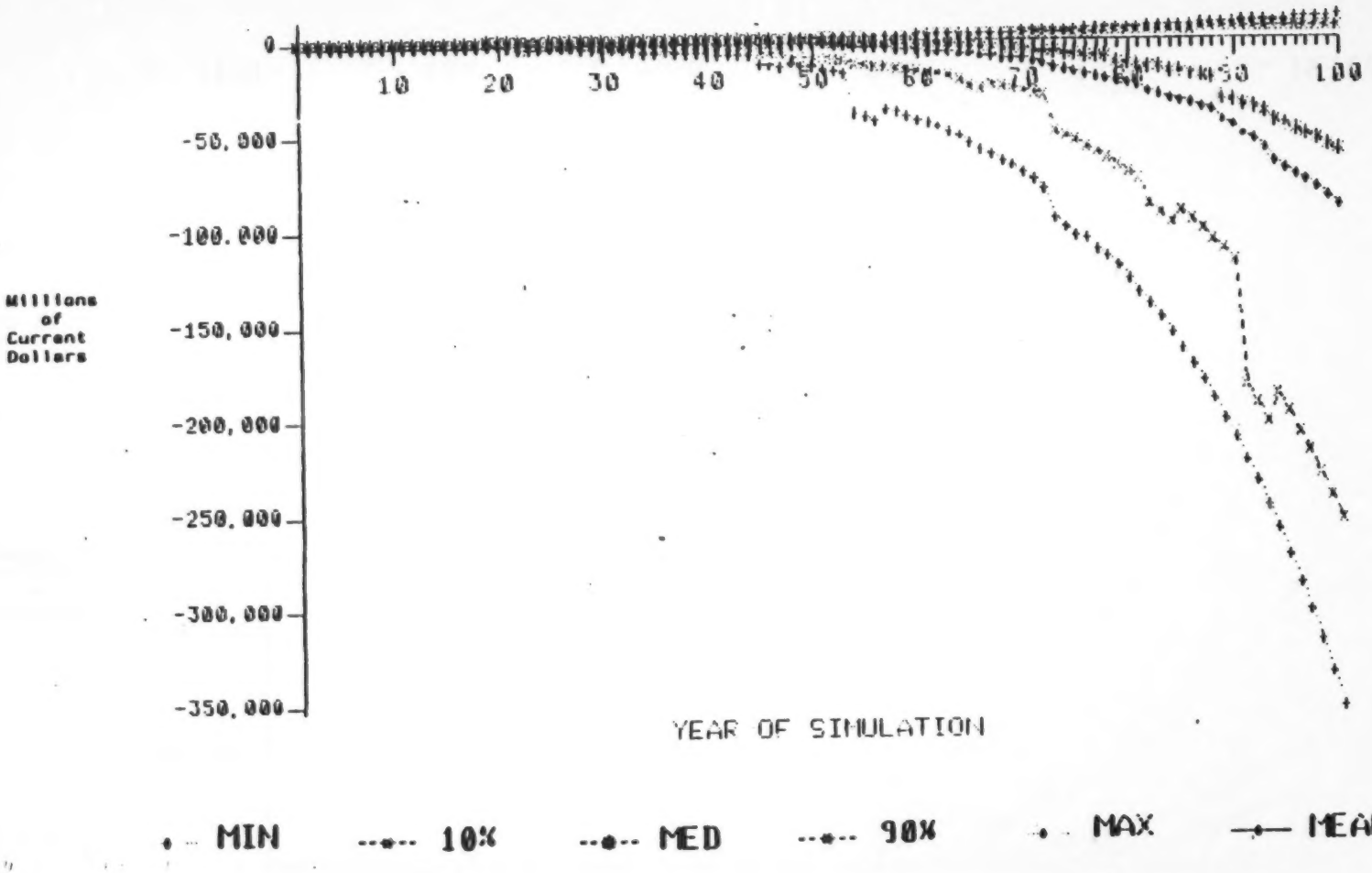
The net effect on the PCLTF can be seen in Graph 2-1. In Simulation 2 the Fund becomes insolvent somewhat earlier than in the Base Case. For instance, while the median Fund balance in Simulation 2 becomes negative in year 51, it does not become negative until year 56 in Simulation 1. The net effect of the partial ban on land disposal, therefore, is to decrease the revenues of the PCLTF more than its expenditures over the next 100 years. The difference between Simulation 1 and Simulation 2 is not drastic, although in practice the land disposal restrictions could seriously diminish the adequacy of the Fund, particularly if revenues are lower than expected and the Fund must pay large claims before it has built up a substantial balance.

Simulation 3 -- Corrective Action Covered After Qualification

This simulation increases PCLTF expenditures on response actions. As Graph 3-1 displays, the outlook for PCLTF adequacy is somewhat worse in this case than in Simulation 1. The

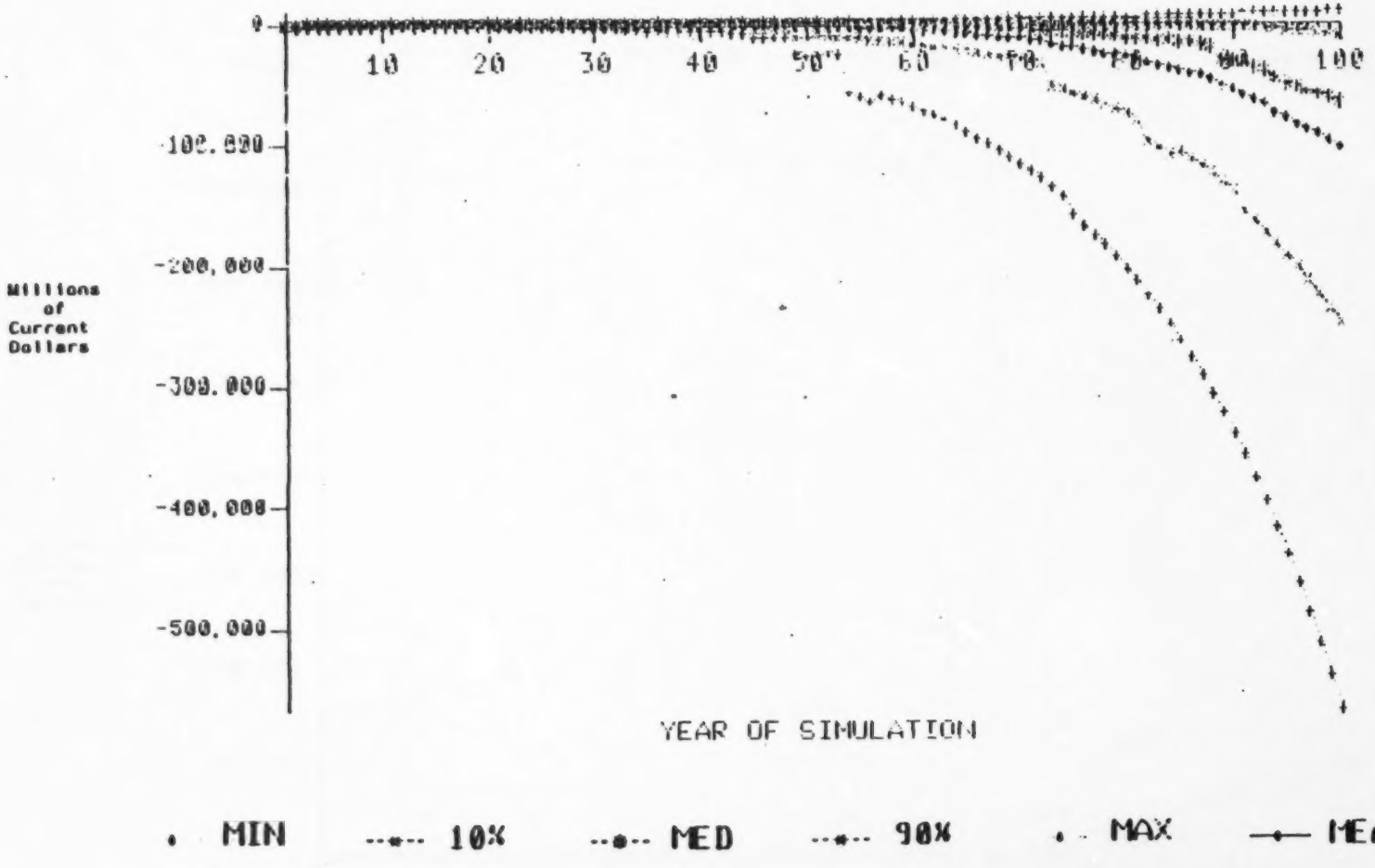
GRAPH 2-1

UNOBLIGATED FUND BALANCE IN MILLIONS OF CURRENT DOLLARS
FOR SIMULATION 2:
PARTIAL BAN OF LAND DISPOSAL



GRAPH 3-1

UNOBLIGATED FUND BALANCE IN MILLIONS OF CURRENT DOLLARS
FOR SIMULATION 3:
COVERAGE OF NON-ROUTINE MONITORING AND RESPONSE
COSTS DURING THE POST-CLOSURE PERIOD



median Fund balance becomes negative in the same year (year 56) as in Simulation 1, but the ninetieth percentile balance becomes negative in year 80 in Simulation 3 as compared with year 99 in Simulation 1. This difference arises from the allocation of non-routine monitoring and response costs to the PCLTF rather than to owners and operators, the Superfund, and State funds. The difference is far more noticeable in the iterations with comparatively low third-party claims, because non-routine monitoring and response costs have a relatively greater influence on Fund adequacy in those iterations.

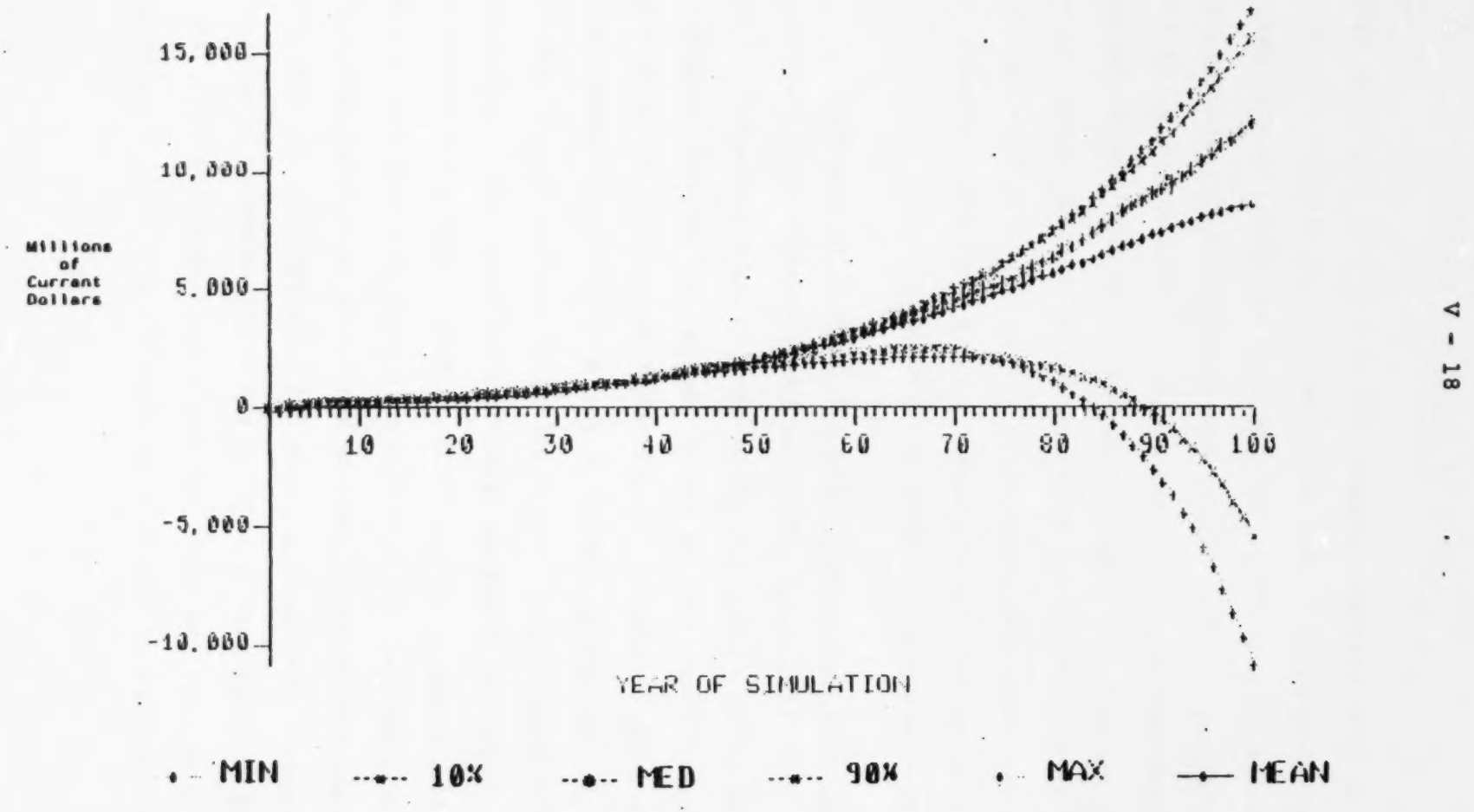
Simulation 4 -- Liabilities Not Covered by the Fund

This simulation, which would be dependent on statutory amendments, eliminates third-party claims (personal injury, economic loss, real property damage, and natural resource damage) from Fund coverage. In all other respects, including facility population and expenditures for monitoring, response, and post-closure care, this simulation is identical to Simulation 1.

Eliminating claims from Fund coverage has a significant effect on the solvency of the PCLTF. Large expenditure shocks are eliminated and the Fund has more than 30 years over which to accumulate interest revenue and build up a large positive balance. The result, presented in Graph 4-1, is that there is only a 10 percent chance of the PCLTF becoming insolvent by year 90, and the mean, median, ninetieth percentile, and maximum observations of the Fund balance are all increasing in year 100.

GRAPH 4-1

UNOBLIGATED FUND BALANCE IN MILLIONS OF CURRENT DOLLARS
FOR SIMULATION 4:
ELIMINATION OF THIRD-PARTY CLAIMS



5.4 Distribution of Land Disposal Costs

Although the simulations presented above show that the PCLTF revenues should be adequate to meet expenditures over the next several decades, its adequacy over that period in large measure results from the Fund's limited coverage of the future costs of land disposal. As Table 5-4 shows, the PCLTF covers only about one percent of the future costs of land disposal (routine monitoring and care, response, and third-party claims, during the operating life and after closure) which EPA has simulated to be allocated to the funding sources shown. In fact, the percentage of costs borne by the different sources remains virtually constant across the simulations presented in the table.

The most important reason why the PCLTF covers such a small percentage of these future costs is that the PCLTF is designed to screen out "problem" facilities, including those which have violated RCRA standards affecting the post-closure safety of the facility, and those which have a "substantial likelihood" of a future release. In addition, the PCLTF does not cover facilities which close in interim status. In Simulation 1, for example, 326 facilities (all of which have final permits) qualify for coverage by the PCLTF over the 100-year period, while 332 permitted facilities fail to qualify (Table 1-1 in Volume II of the report on the simulation model). A total of 253 facilities do not receive final permits and thus are also ineligible for PCLTF coverage. Altogether, then, approximately one-third of closed land disposal facilities qualify for coverage under the eligibility policies simulated in this report. A stricter interpretation of

Table 5-4
Distribution of Land Disposal Costs*
Present Value Over 100 Years
With Discount Rate of 0.06
(millions of 1982 dollars)

Payee	No PCLTF		Simulation 1: Current PCLTF Statute		Simulation 2: Partial Ban on Land Disposal		Simulation 3: Corrective Action Covered During Post-Closure Period		Simulation 4: Elimination of 3rd-Party Claims	
	$ Allocated	% of Total $	$ Allocated	% of Total $	$ Allocated	% of Total $	$ Allocated	% of Total $	$ Allocated	% of Total $
PCLTF	0	0	89	1	93	1	95	1	5	0**
Owner/Operator	8571	86	8291	83	8174	82	8457	84	8325	83
Superfund	306	3	299	3	297	3	301	3	302	3
States	72	1	71	1	86	1	81	1	72	1
TOTAL ALLOCATED	8949	89	8750	87	8650	86	8934	89	8704	87
UNALLOCATED	1083	11	1282	13	1382	14	1098	11	1328	13
TOTAL	10032	100	10032	100	10032	100	10032	100	10032	100

* Columns may not sum correctly because of rounding errors.
**Values less than 0.5% are rounded to zero.

"no substantial likelihood," coupled with disqualification for violations of either the RCRA regulations or the conditions of the facility permit, would further reduce eligibility.

Although one-third of the closed disposal facilities qualify for PCLTF coverage under the eligibility policies modeled by EPA, the results as reflected in Table 5-4 show the PCLTF covering a far smaller portion of the overall costs. There are two reasons for this. First, the Fund does not pay any costs incurred during the operating life of a facility and, in the Base Case, does not pay any response costs incurred before the end of the post-closure period. Second, facilities that fail to qualify for the PCLTF because of on-site or off-site releases contribute disproportionately to the total costs of land disposal; response costs and third-party claims are higher for these facilities than for those that qualify for the PCLTF. One result of the narrowly defined cost-coverage policies of the PCLTF is that the Superfund covers a larger percentage of these costs (for response actions and natural resource damages) than does the PCLTF. A second result is that an estimated 13 percent of the future costs of land disposal are not covered by any funding source.

The selective eligibility criteria of the PCLTF, if implemented in the manner simulated, would conserve Fund resources by excluding facilities that are almost certain to require large expenditures for response actions and third-party claims. However, the same selectivity will leave a larger portion of the future costs of land disposal to be covered by the Superfund, and some of the costs will not be covered by any funding source.

CHAPTER 6: REVENUE ANALYSIS

This chapter examines how revenue policies for the Post-Closure Liability Trust Fund (PCLTF) could be adjusted to yield a solvent Fund in each of the four simulations presented in Chapter 5.

6.1 Description of the Revenue Analysis

The revenue analysis takes as an input the simulated expenditure stream from each iteration of the model. In other words, the revenue analysis which follows was performed on the results of the four simulations presented in Chapter 5 of this report. The revenue analysis is based on the quantity of waste assumed to be disposed in the respective simulations; the tax level is assumed to have no effect on the demand for waste disposal. In addition, EPA has assumed that there will be full payment of the PCLTF tax. If nonpayment is a significant problem, the tax rates calculated in this analysis will not achieve the revenue goal on which the analysis is based.

The revenue analysis presented here is a relatively simple "break-even analysis." Volume I, Chapter 5 of the report on the PCLTF Simulation Model provides a full description of the capabilities of the revenue analysis module and presents the results of a more complicated analysis of revenue policies. The break-even analysis calculates the initial tax rate for each iteration of a simulation which, if collected every year, will result in sufficient tax revenues so that total Fund revenues (including both tax revenues and interest revenues) minus Fund expenditures equal the target balance at the end of the simulation.

The break-even tax rate varies from iteration to iteration because the Fund expenditures vary.

6.2 Results of the Revenue Analysis

The results of the break-even analysis are presented in Table 6-1. The tax rates were calculated to produce a Fund balance in year 100 of $10.7 billion (about $200 million in 1982 dollars) and the tax is assumed to be collected in every year (i.e., there is no ceiling on the Fund). Results are presented for both an inflation-adjusted tax rate and a nominally-constant rate. For the indexed tax rate, the value presented in Table 6-1 is the tax rate in the first year of the simulation.

As with the simulation results presented in the previous chapter, the results of the revenue analysis reflect the uncertainty involved in estimating the future expenditures of the PCLTF. With no ceiling on the Fund, the median tax rate needed to meet the target balance in year 100 is $2.65 per dry-weight ton. Of course, at this tax rate there is a 50 percent chance that the Fund balance will be above the target balance in year 100 and an equal chance that the Fund balance will be below the target. The probability of the Fund balance being below the target in year 100 can be reduced to 10 percent by increasing the tax rate to $7.76 per dry-weight ton.

It is important to note that the tax rates presented in Table 6-1 do not ensure positive Fund balances in perpetuity. Large positive balances built up in the early years may be eroding quickly in year 100. Moreover, the analysis is based on a large

Table 6-1
Summary of Revenue Analysis Results
(dollars per dry-weight ton*)

Simulation	Tenth Percentile	Mean	Median	Ninetieth Percentile
1. Current PCLTF Statute				
Indexed tax rate	0.39	1.43	1.04	3.04
Constant tax rate	0.99	3.65	2.65	7.76
2. Partial Land Disposal Ban				
Indexed tax rate	0.45	2.07	1.60	4.80
Constant tax rate	1.07	4.84	3.74	11.22
3. Coverage of Corrective Action During Post-Closure Period				
Indexed tax rate	0.49	1.56	1.11	3.14
Constant tax rate	1.26	3.97	2.84	8.02
4. No PCLTF Coverage of Third Party Claims				
Indexed tax rate	0.22	0.29	0.26	0.44
Constant tax rate	0.56	0.75	0.66	1.14

* Tax rates based on gross weight would be approximately one-third to one-fifth the rates presented in this table.

number of assumptions about the Fund's tax base and expenditures over the next 100 years. Although EPA believes its assumptions to be reasonable, the future will certainly prove them to be incorrect to some degree. In particular, EPA made no attempt to include certain critical events (for example, major economic recessions) or changes in policy (other than a partial ban on land disposal) in this analysis.